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Kang et al.

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(54) **REFRIGERATOR**

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F25D 23/06 (2006.01)

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CPC **F25D 23/064** (2013.01); **F25D 2201/14** (2013.01)

(58) **Field of Classification Search**
CPC F25D 23/065; F25D 23/062; F25D 23/064;
F25D 23/066; F25D 11/00; F25D 2201/12
USPC 312/406, 406.1, 400, 401, 409
See application file for complete search history.

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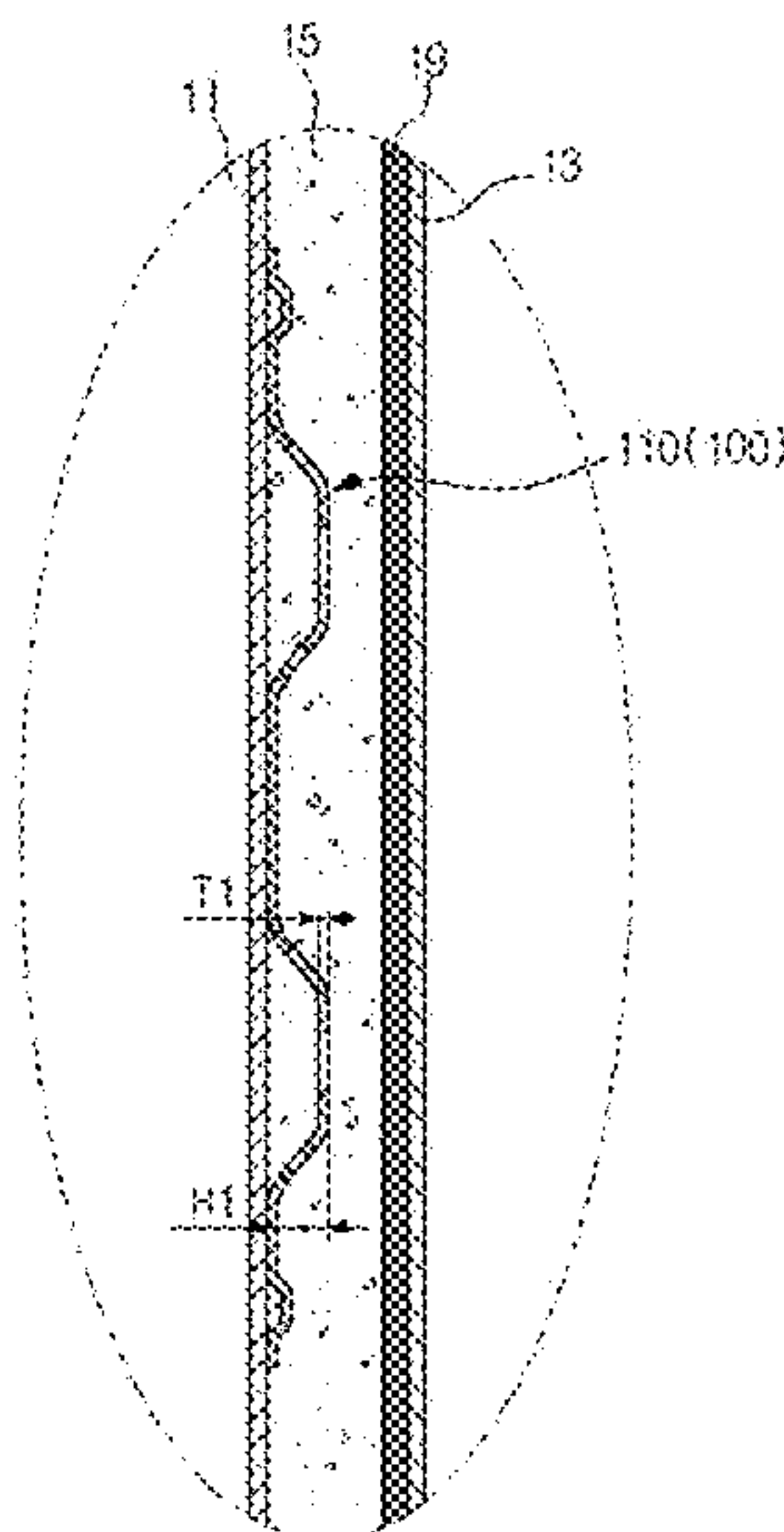
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(57) **ABSTRACT**

A body of a refrigerator may be deformed when the rigidity of the body is lowered due to a thickness of insulation being reduced to increase an internal capacity of the body. Deformation of the body of the refrigerator is reduced by improving rigidity of the body using a reinforcement structure. The refrigerator may include an electric apparatus box in which electric apparatus components for controlling an operation of the refrigerator are accommodated. Electric components may be disposed in a hinge cover which is disposed in the front of the refrigerator to improve spatial utility and a reinforcement plate formed of a steel material may be disposed in the electric apparatus box to prevent a fire from spreading.

19 Claims, 49 Drawing Sheets



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FIG. 1

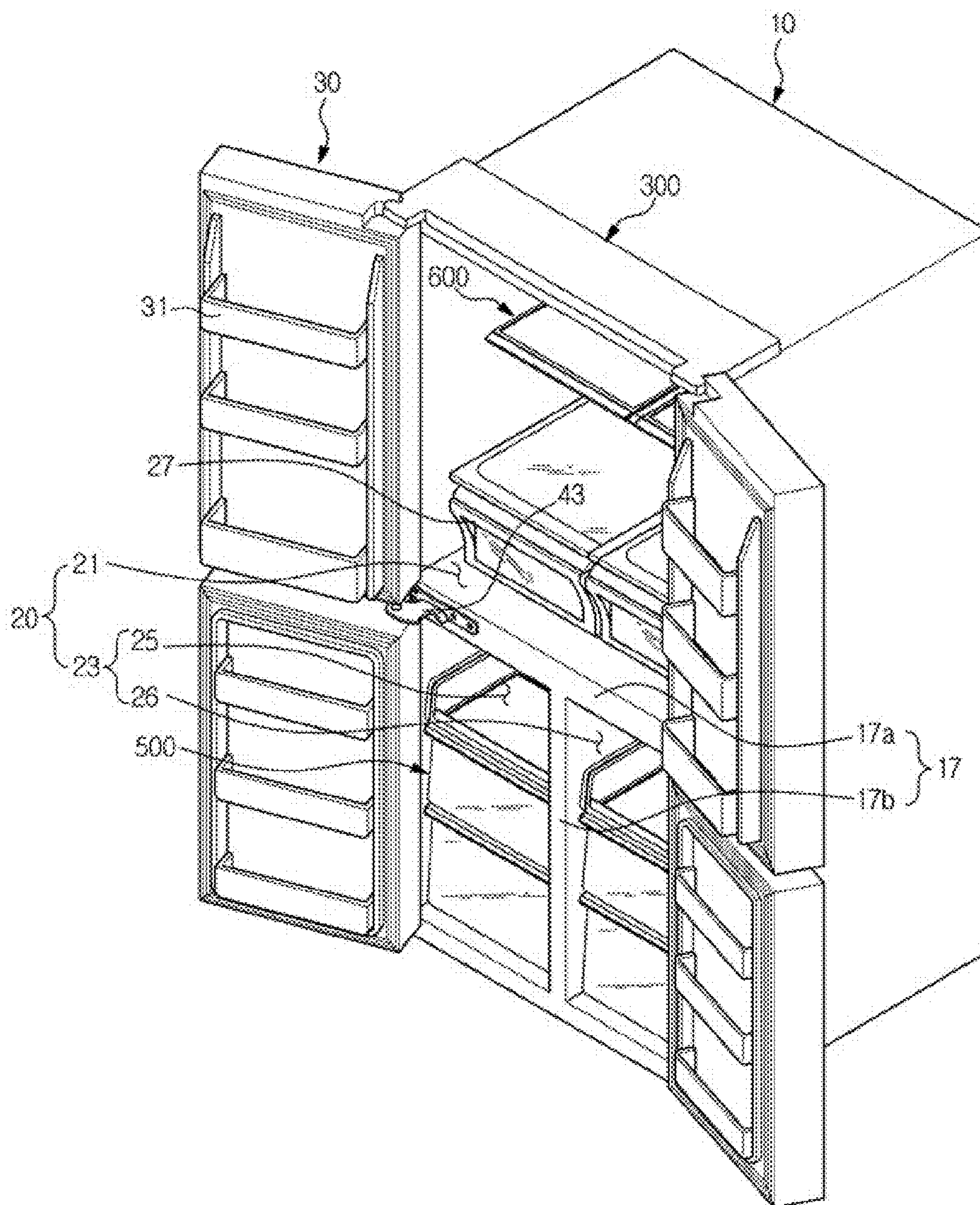


FIG. 2

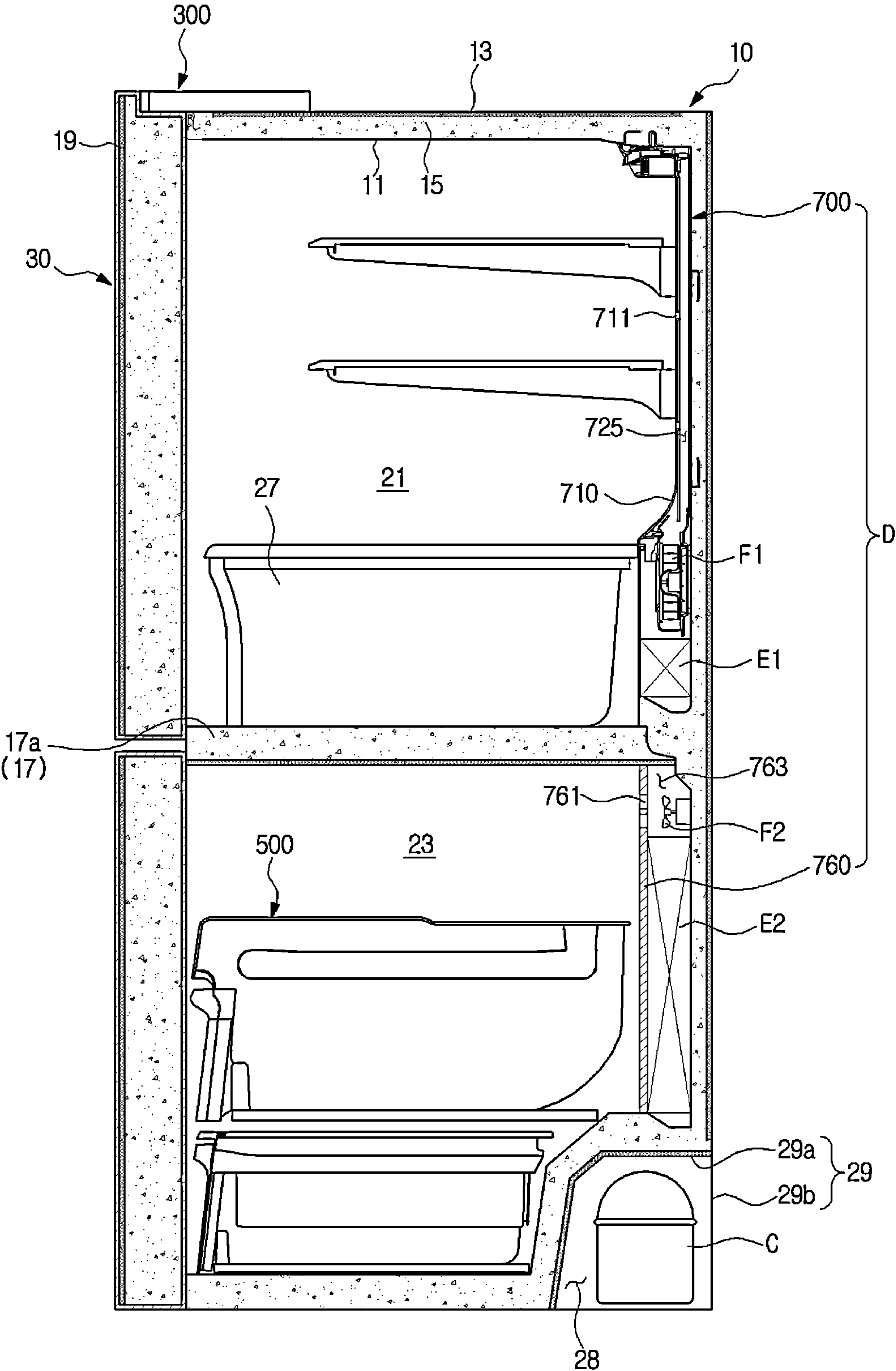


FIG. 3

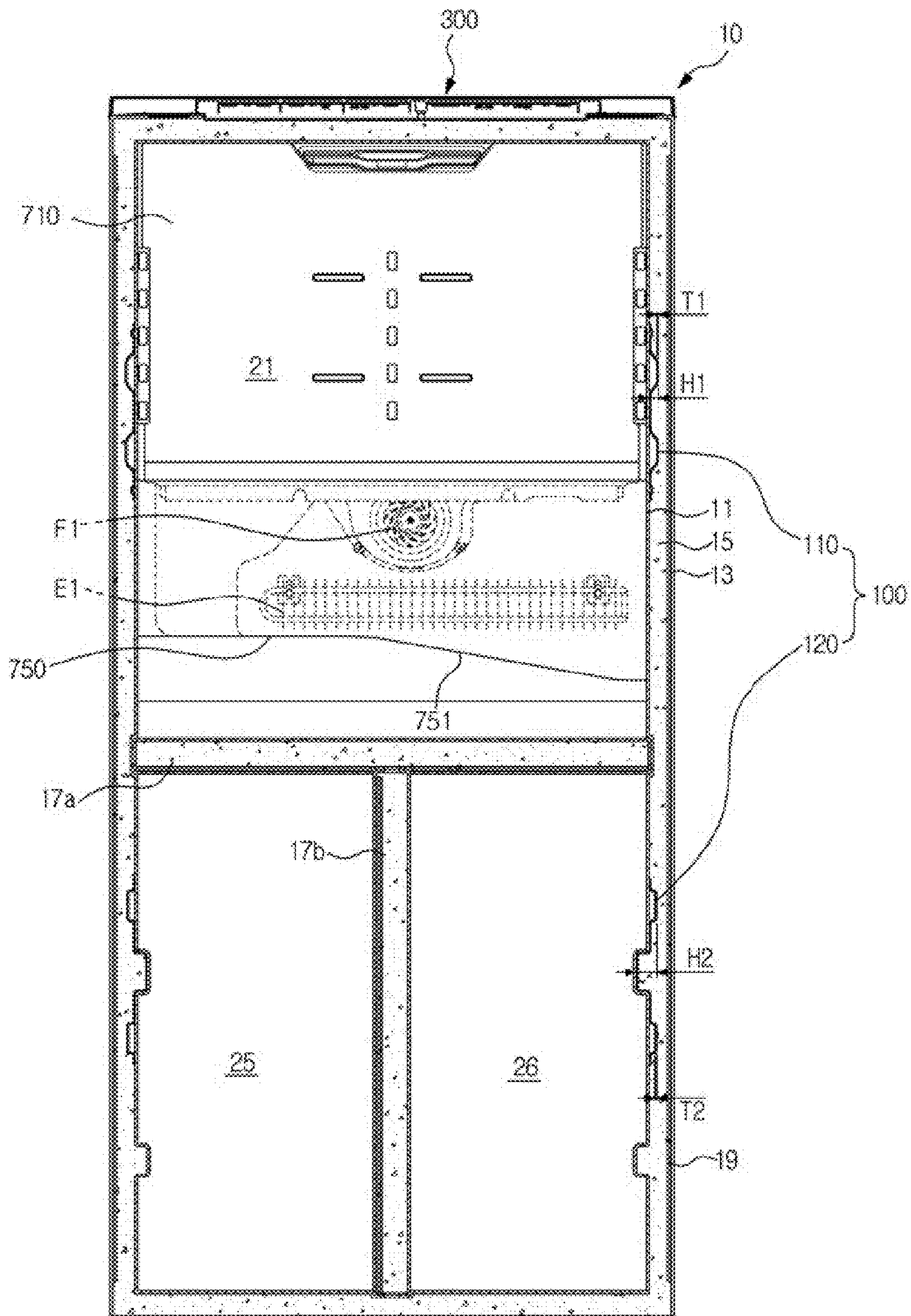


FIG. 4

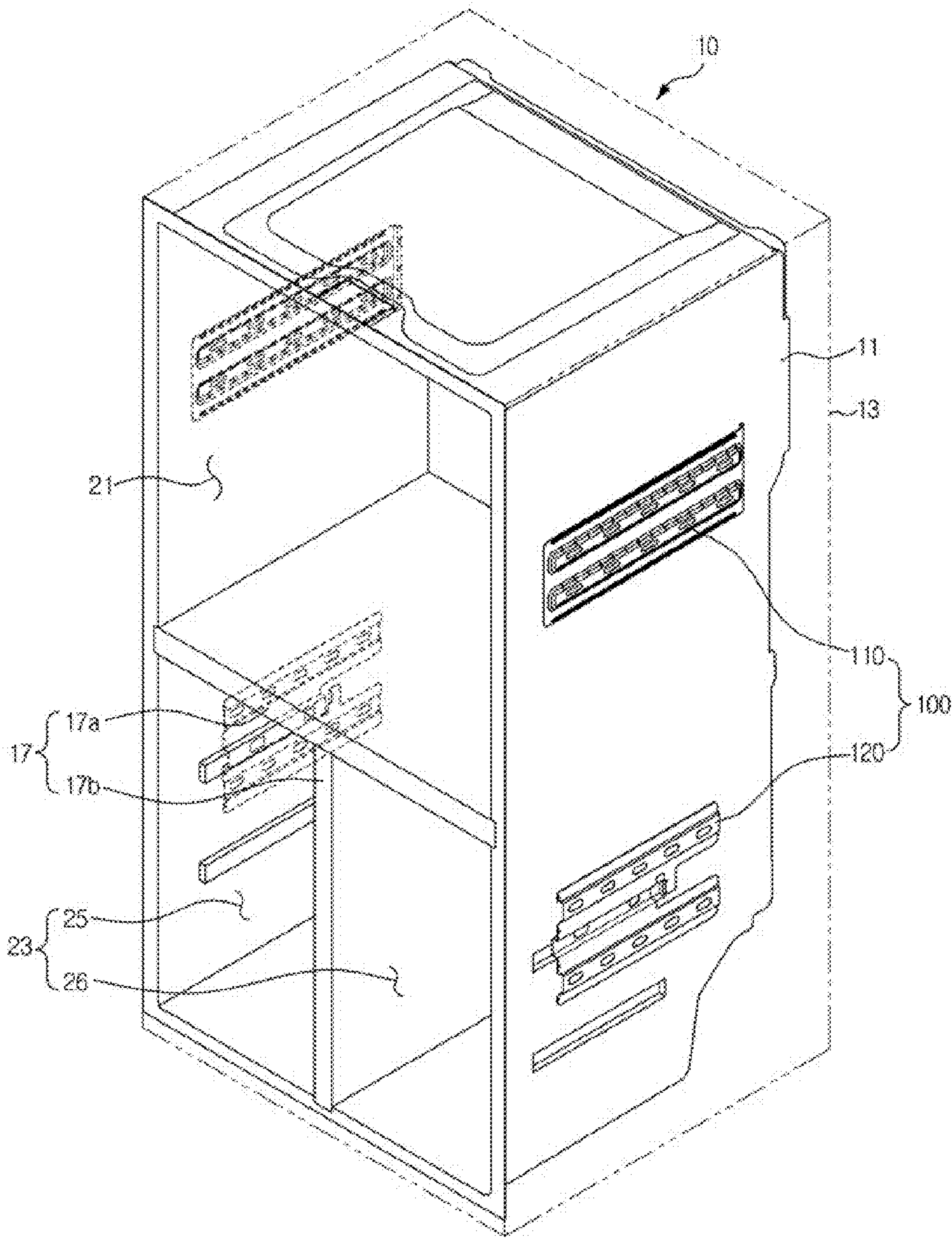


FIG. 5

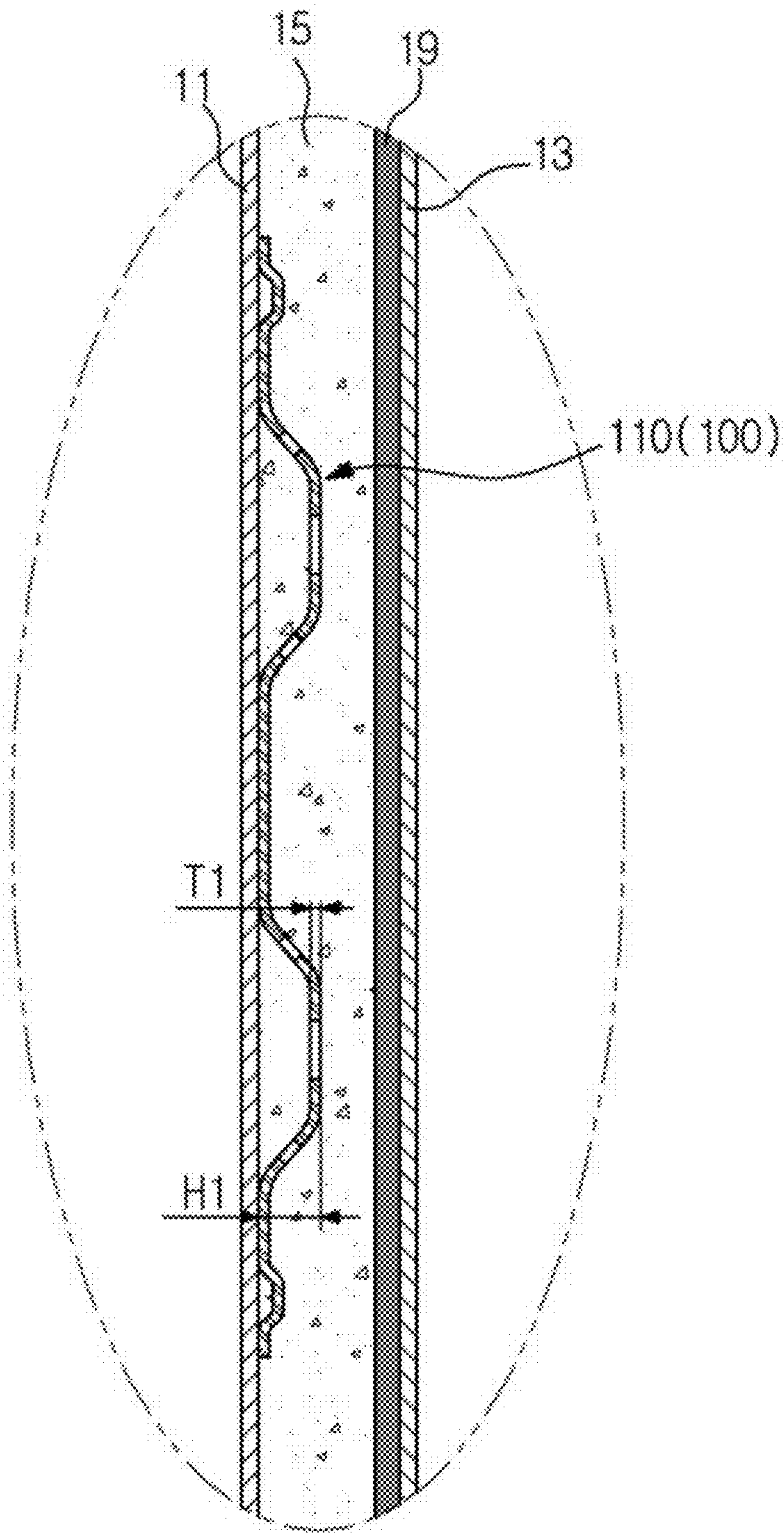


FIG. 6

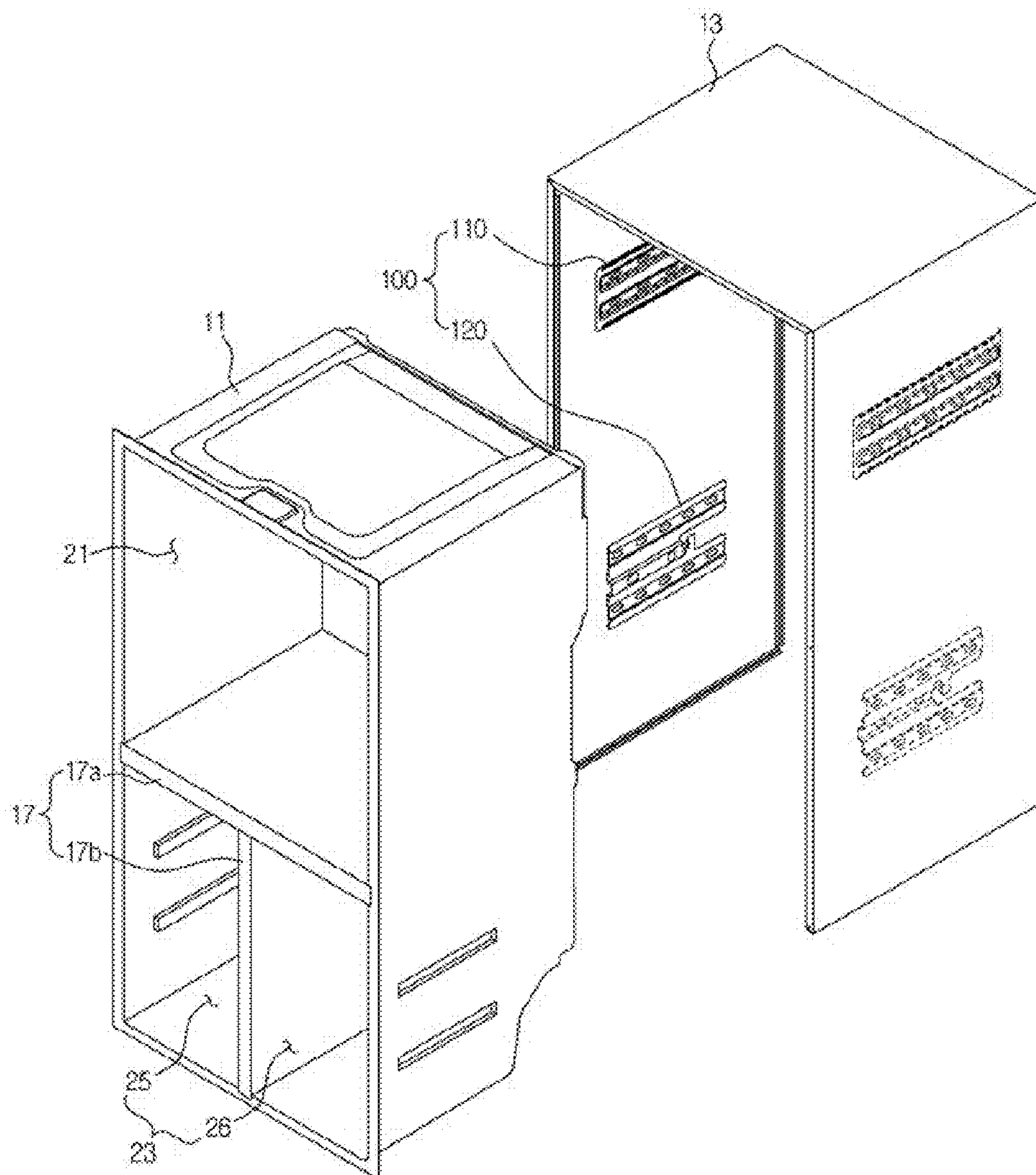


FIG. 7

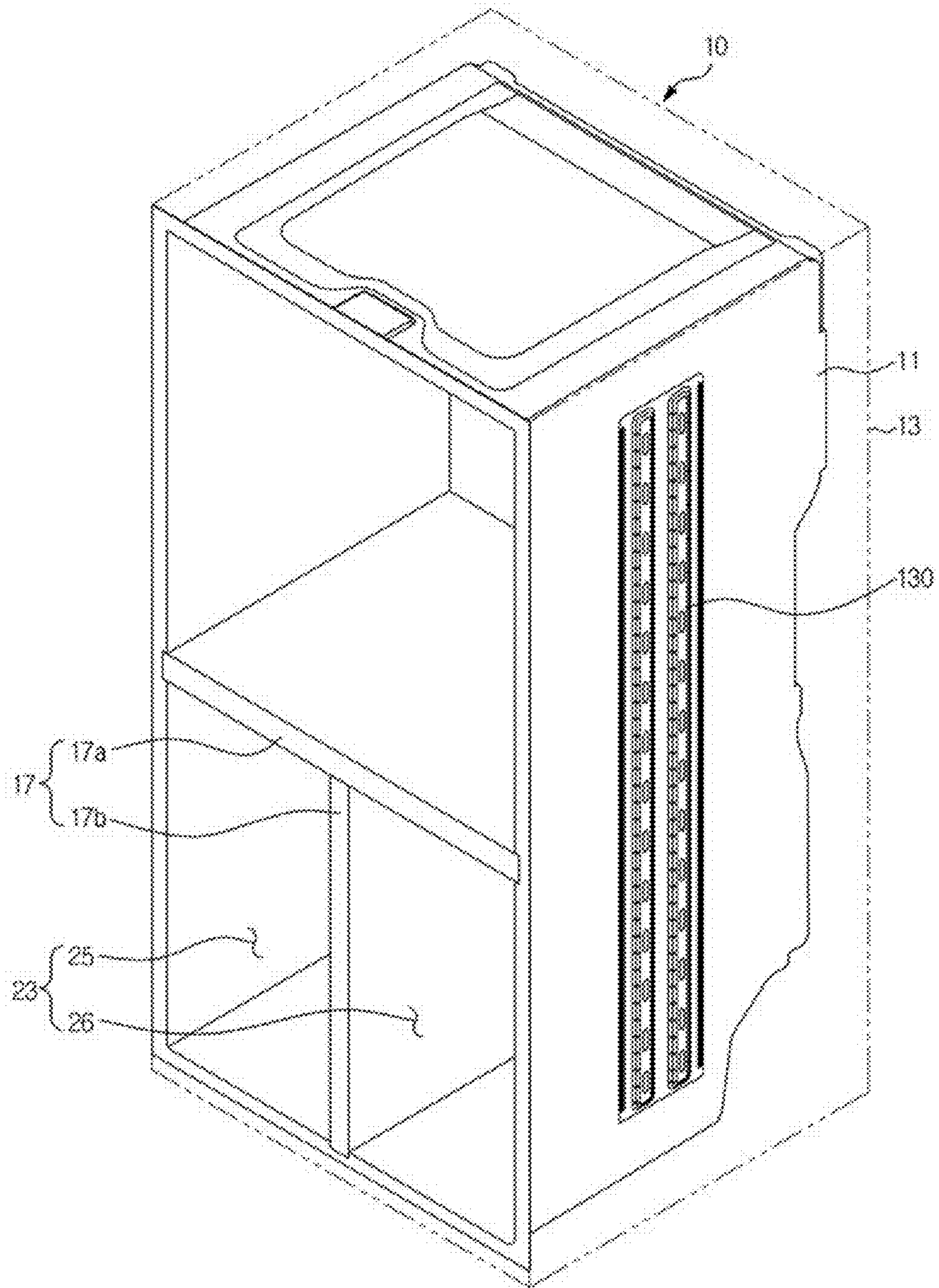


FIG. 8

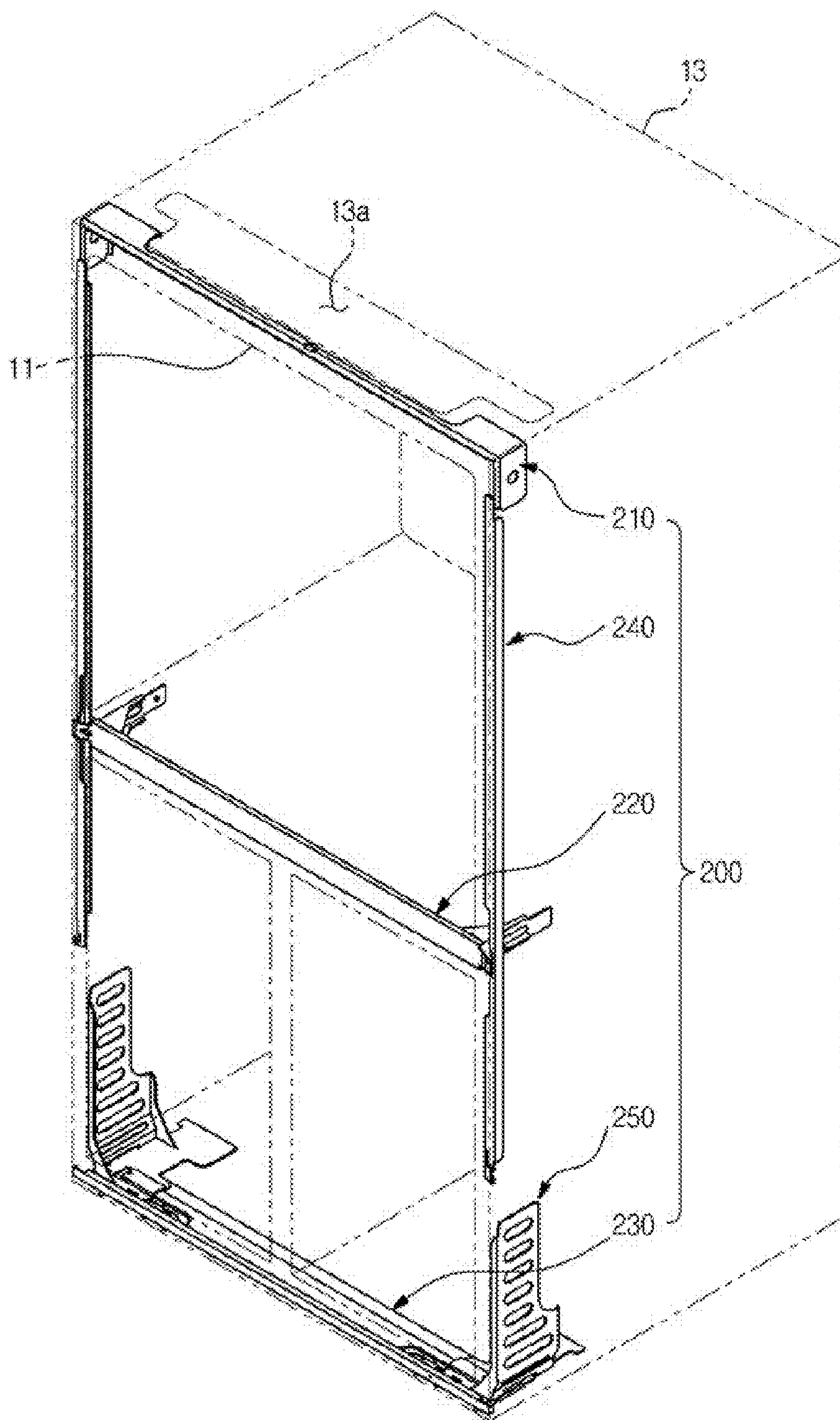


FIG. 9

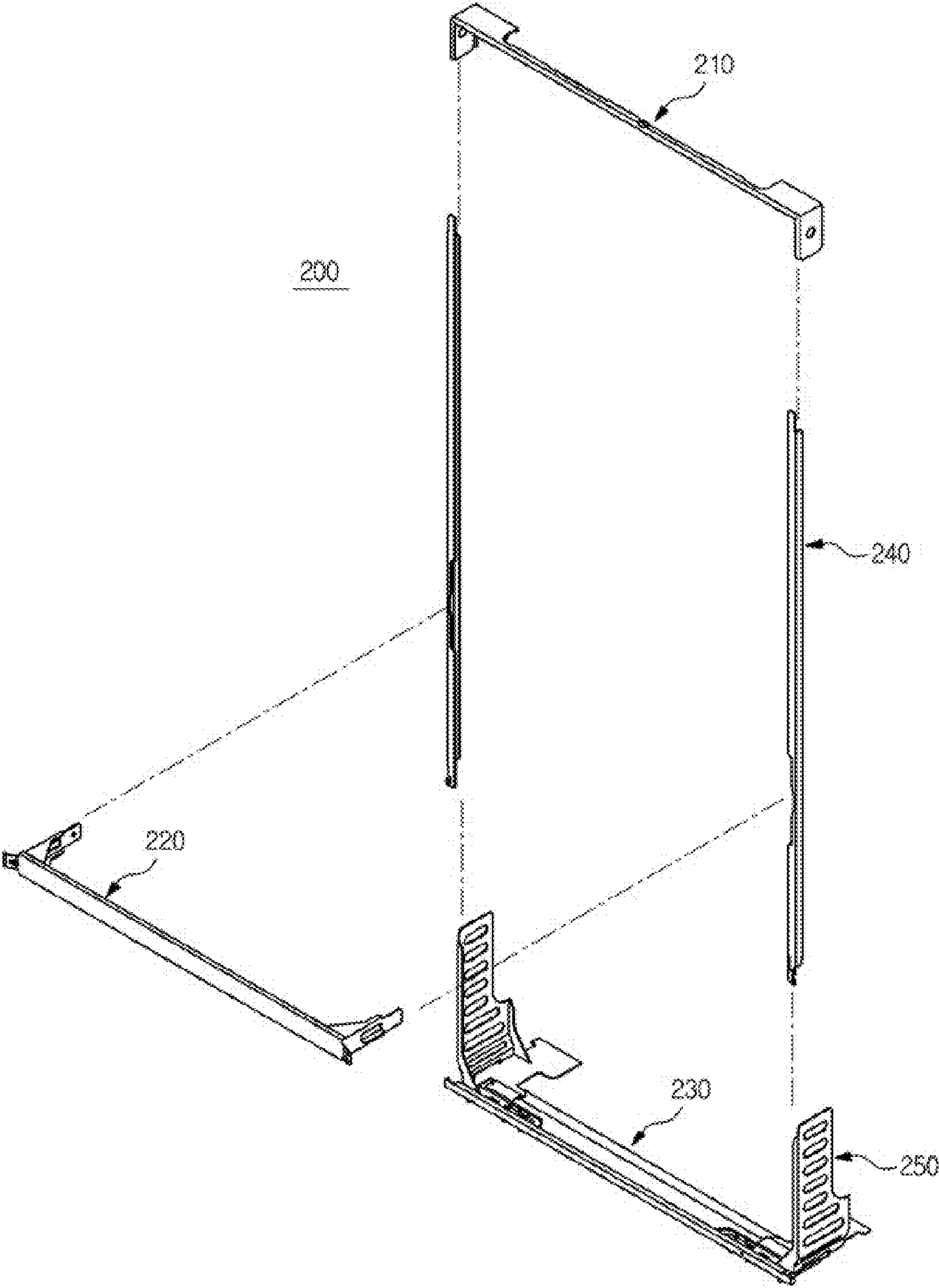


FIG. 10

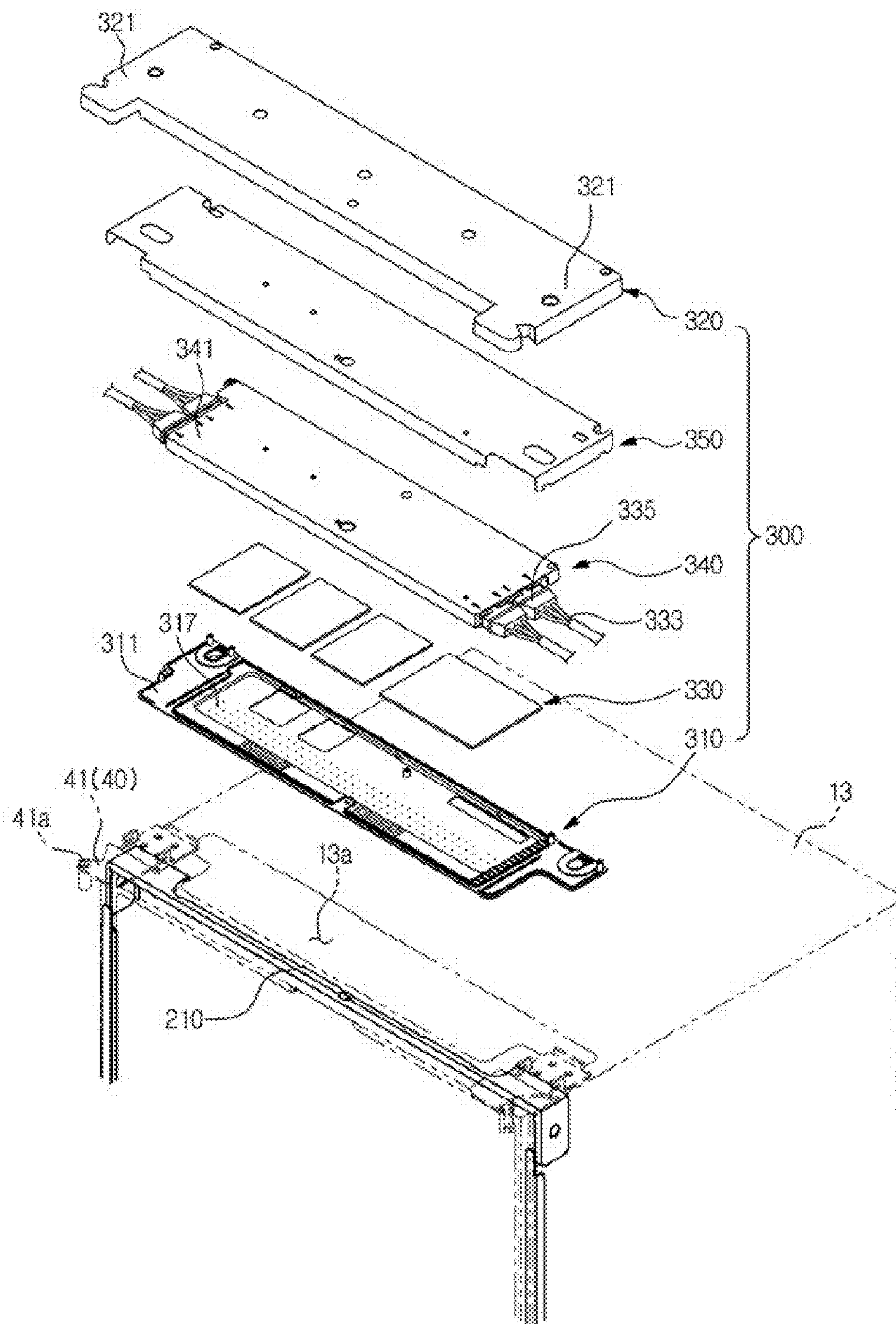


FIG. 11

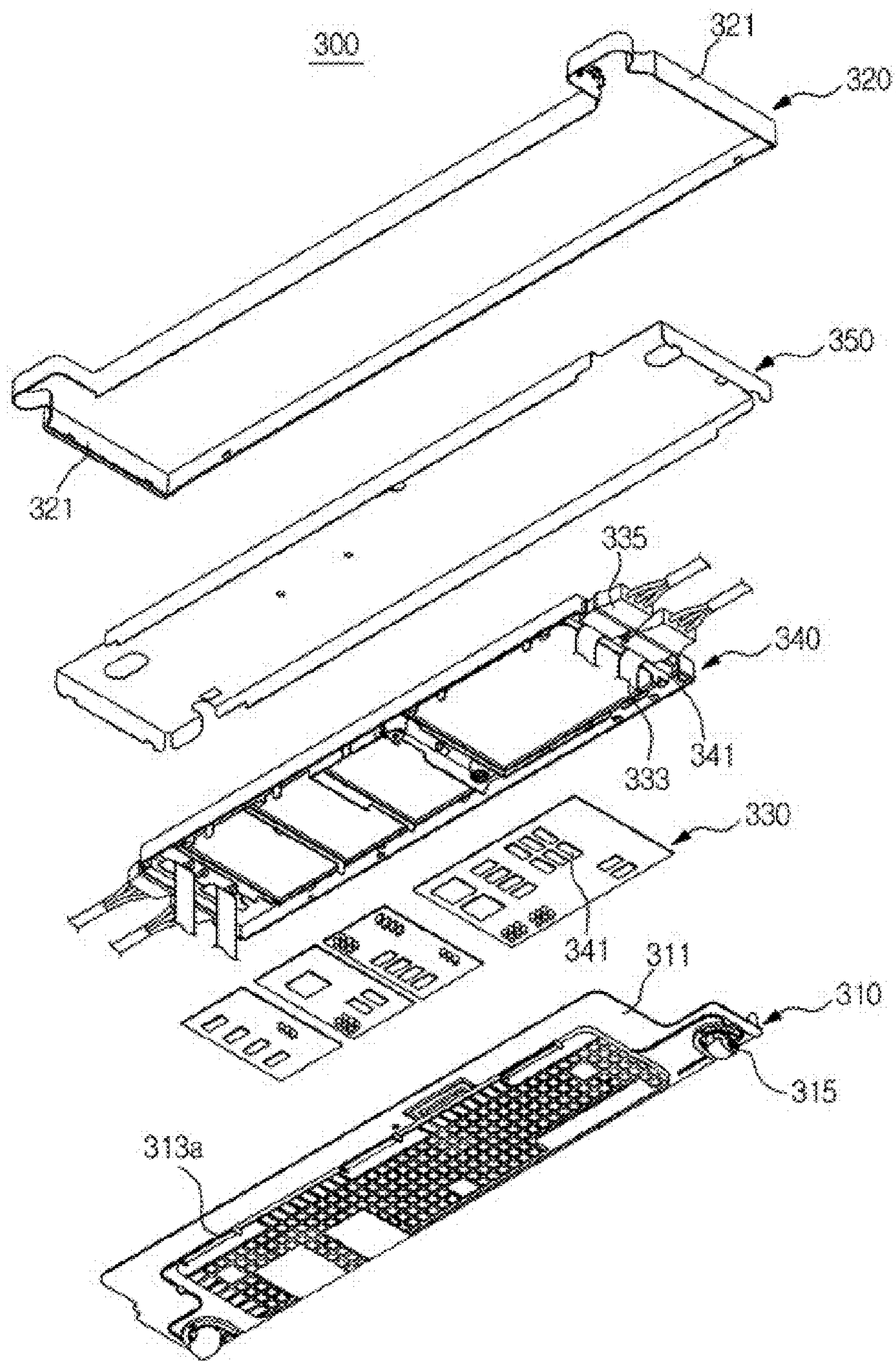


FIG. 12

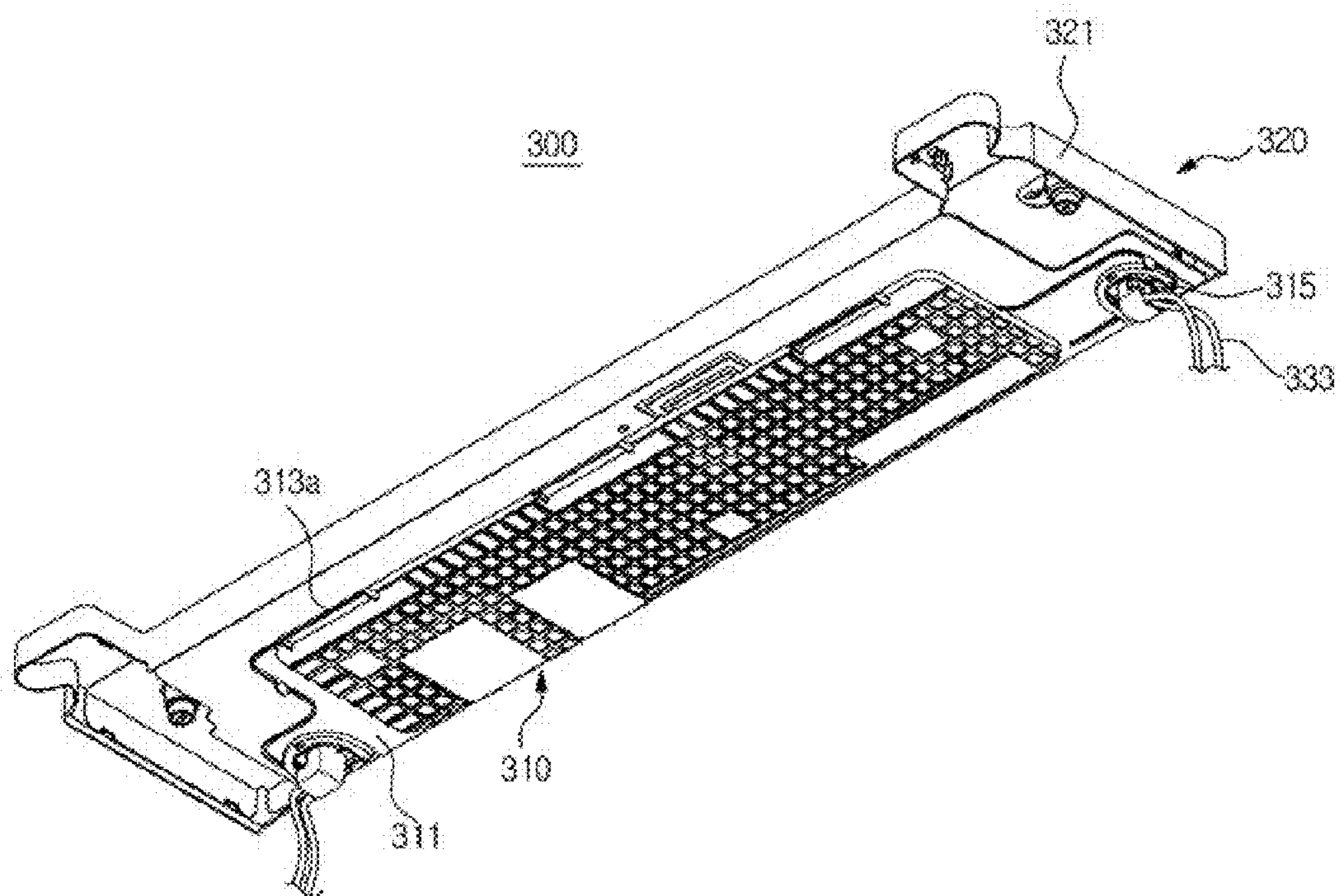


FIG. 13

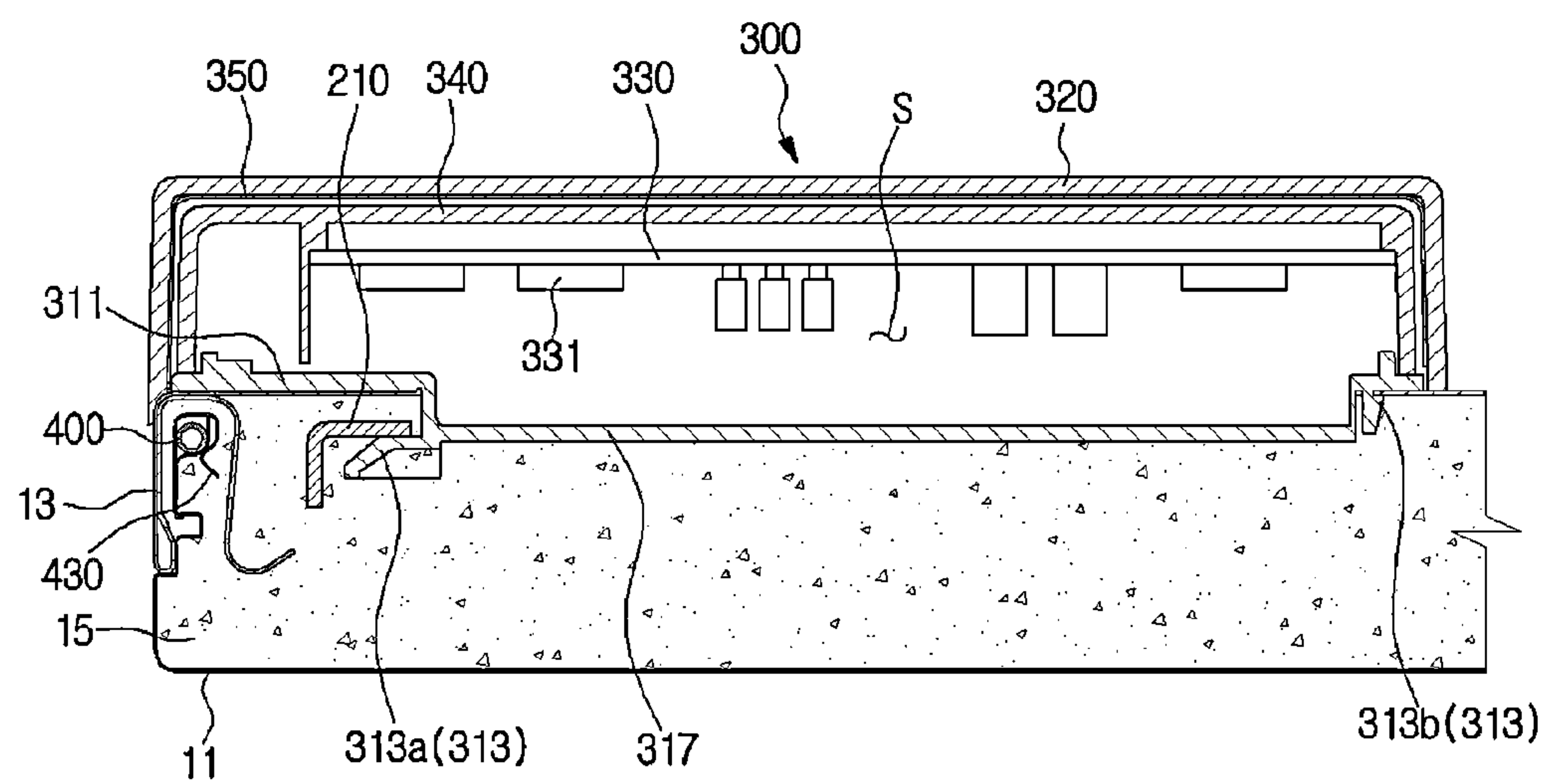


FIG. 14

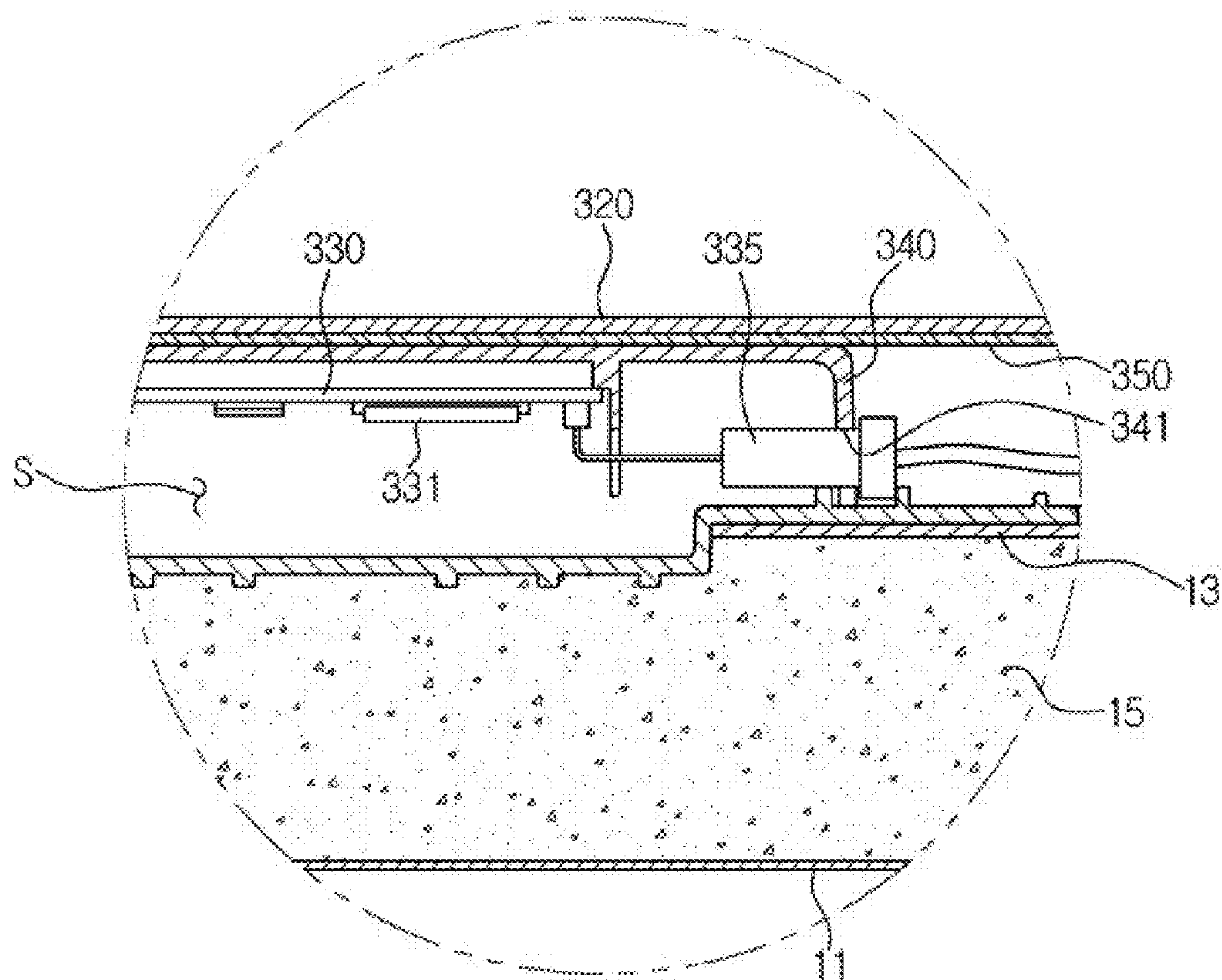


FIG. 15

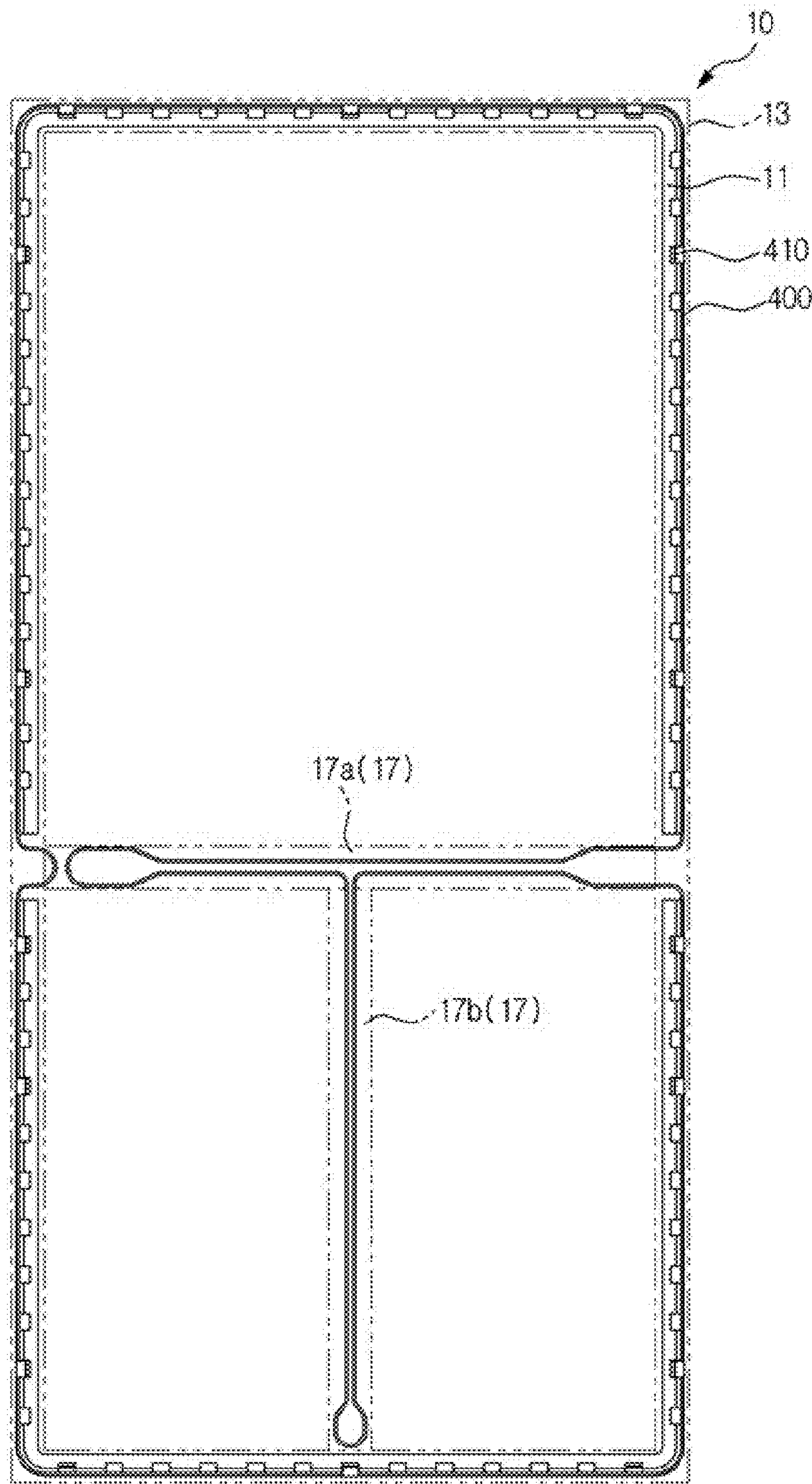


FIG. 16

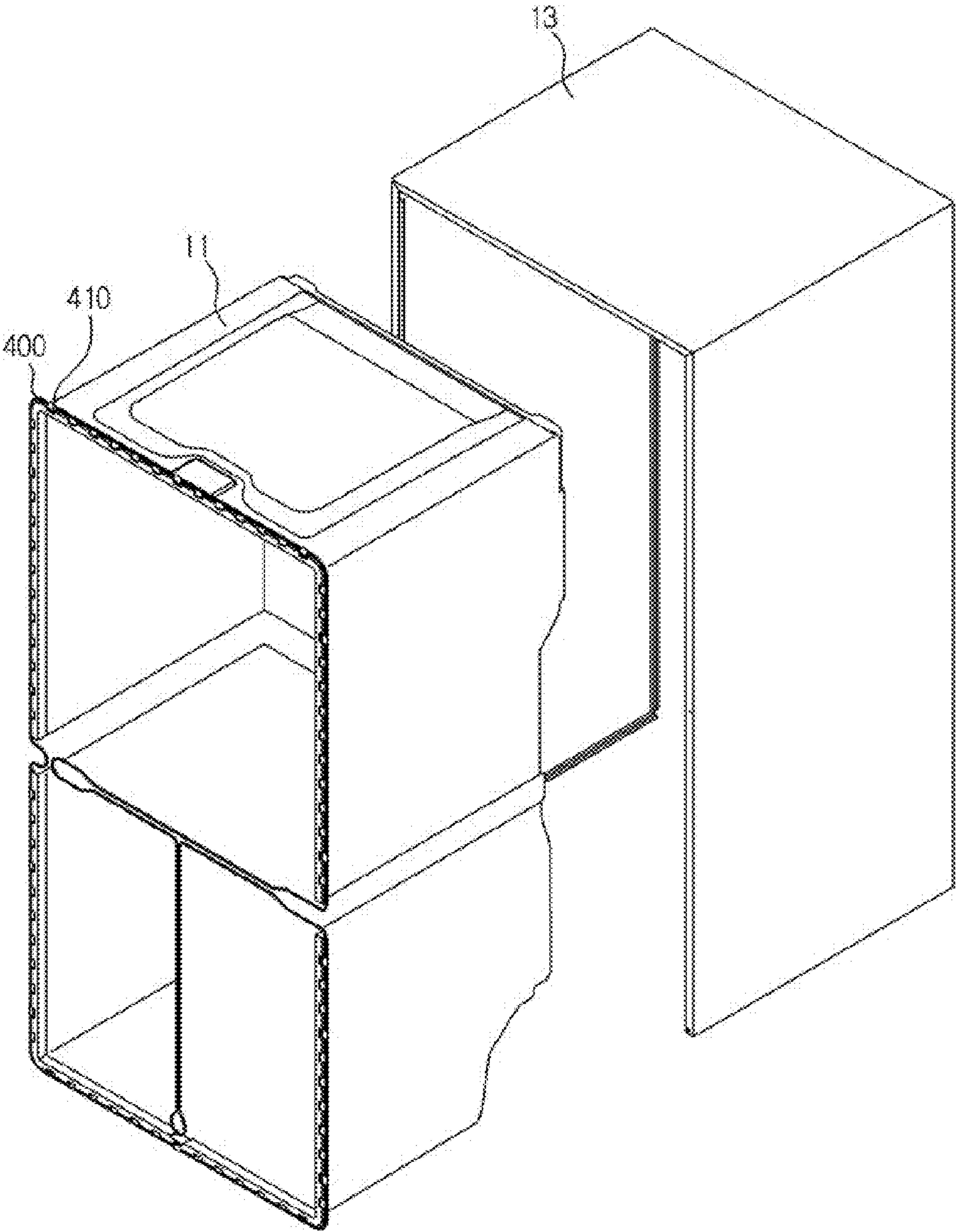


FIG. 17

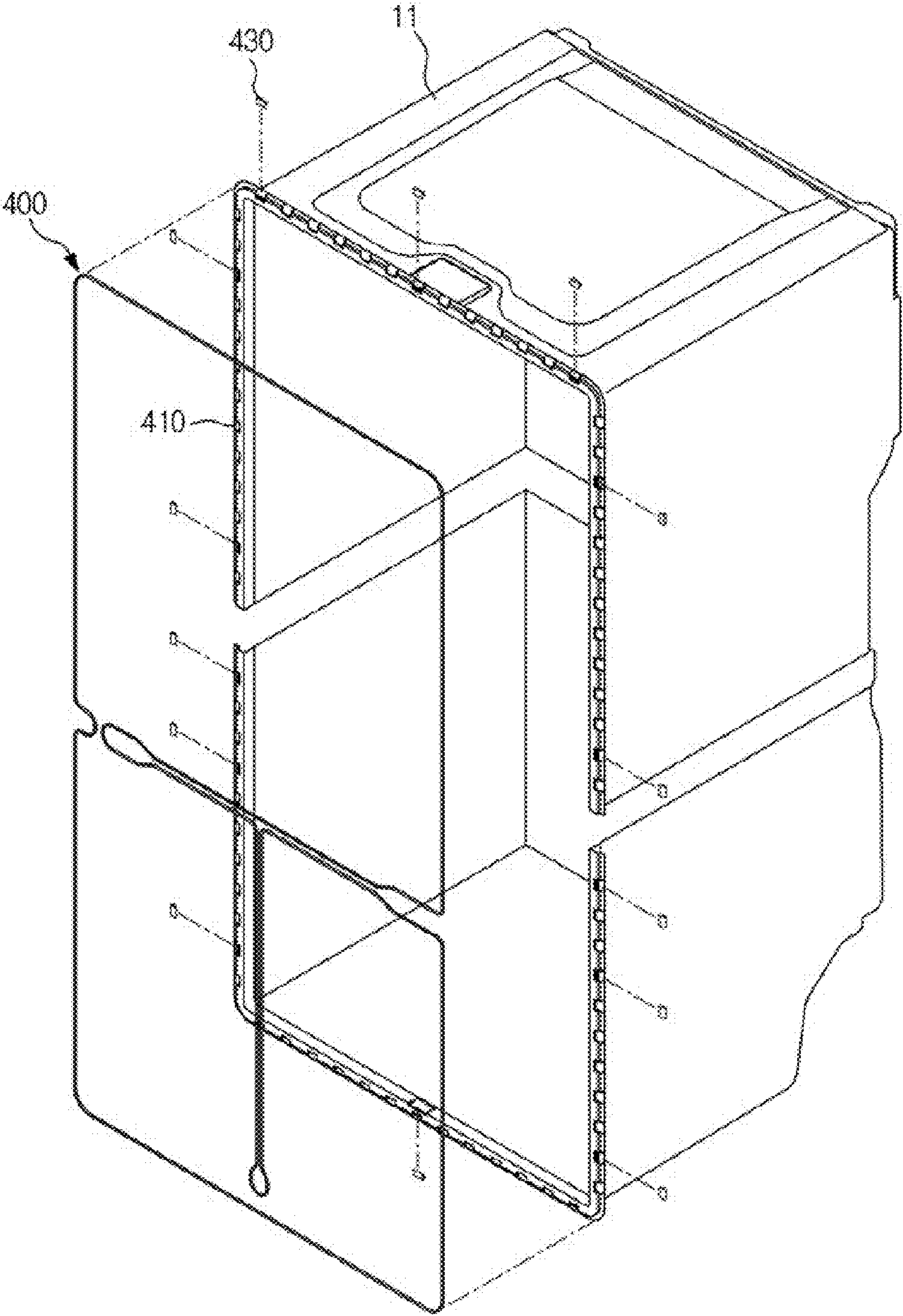


FIG. 18

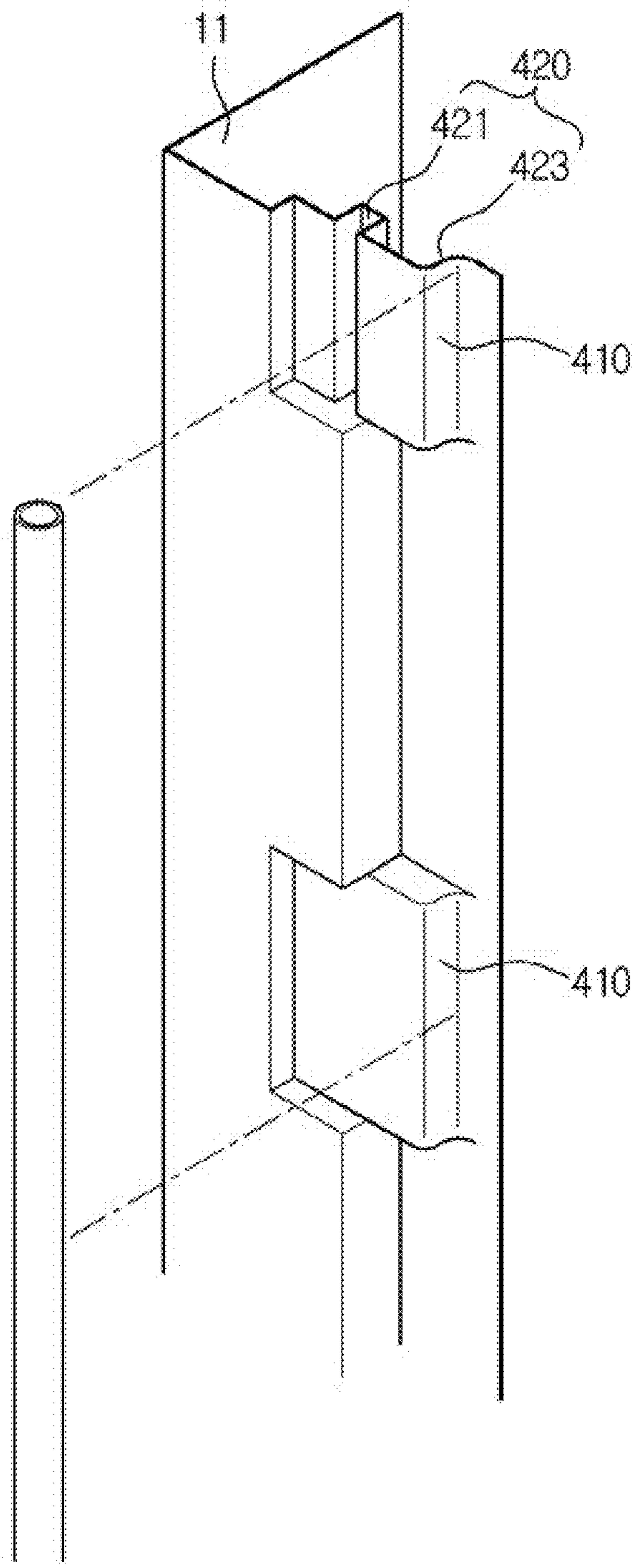


FIG. 19

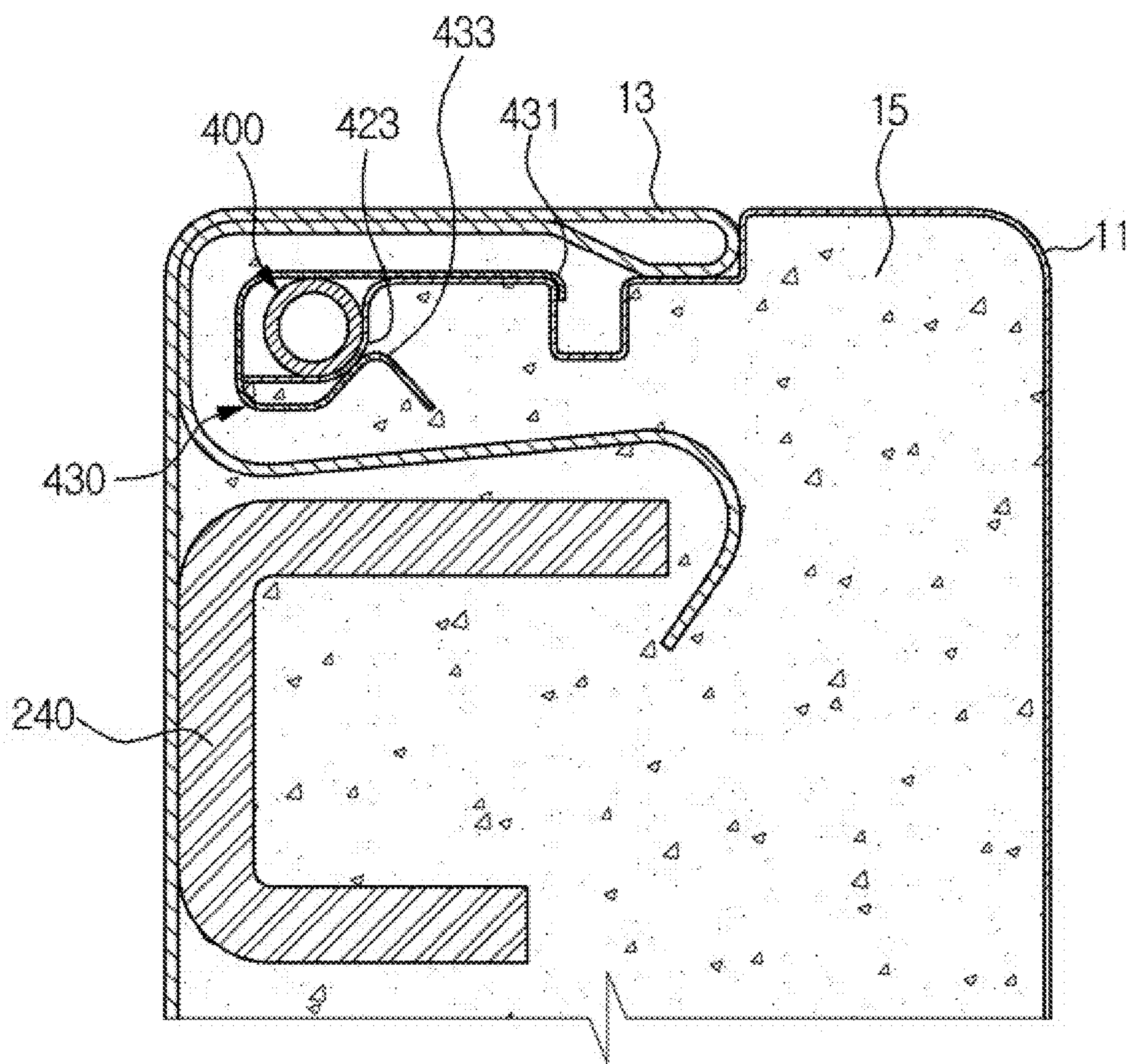


FIG. 20

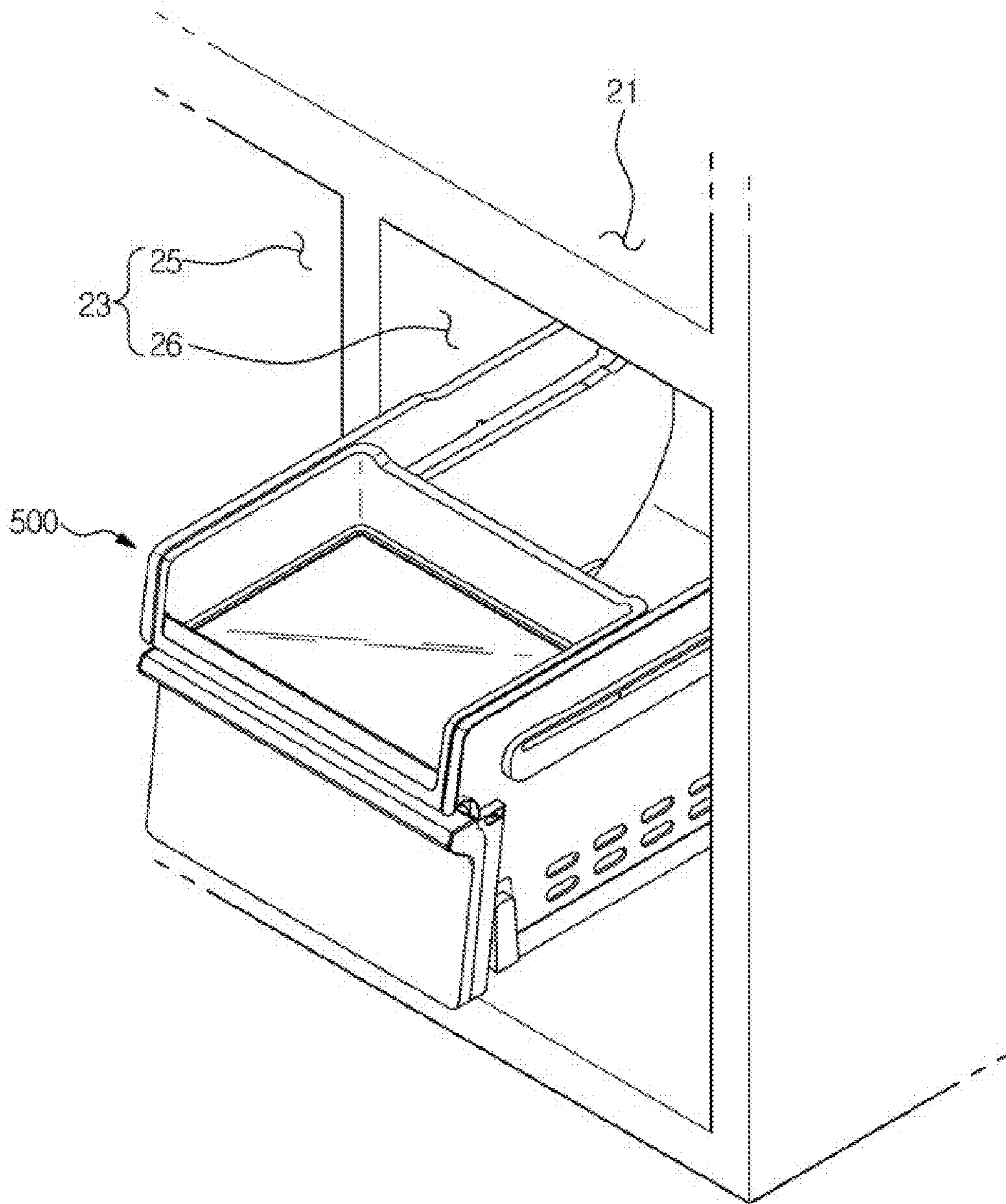


FIG. 21

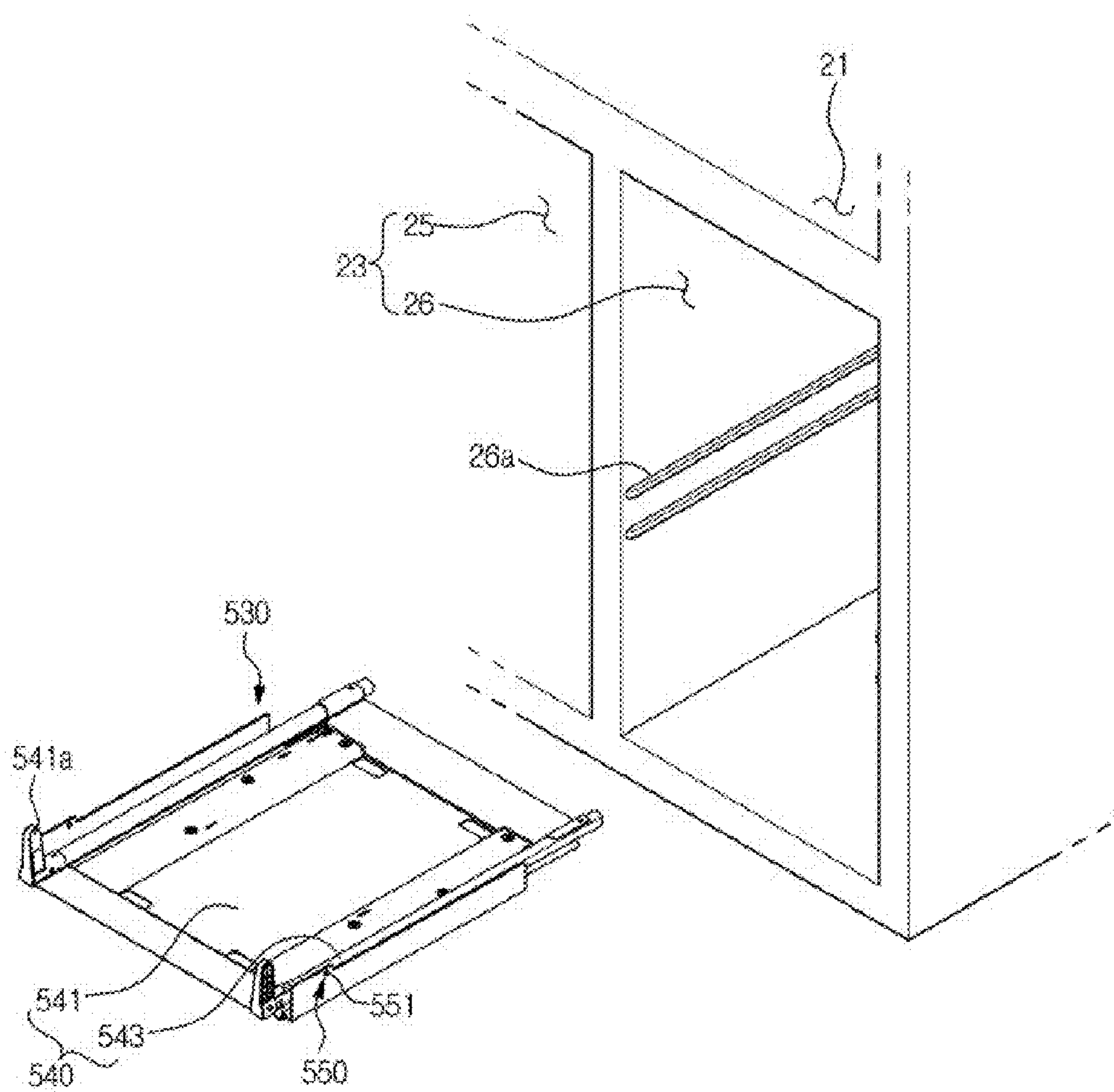


FIG. 22

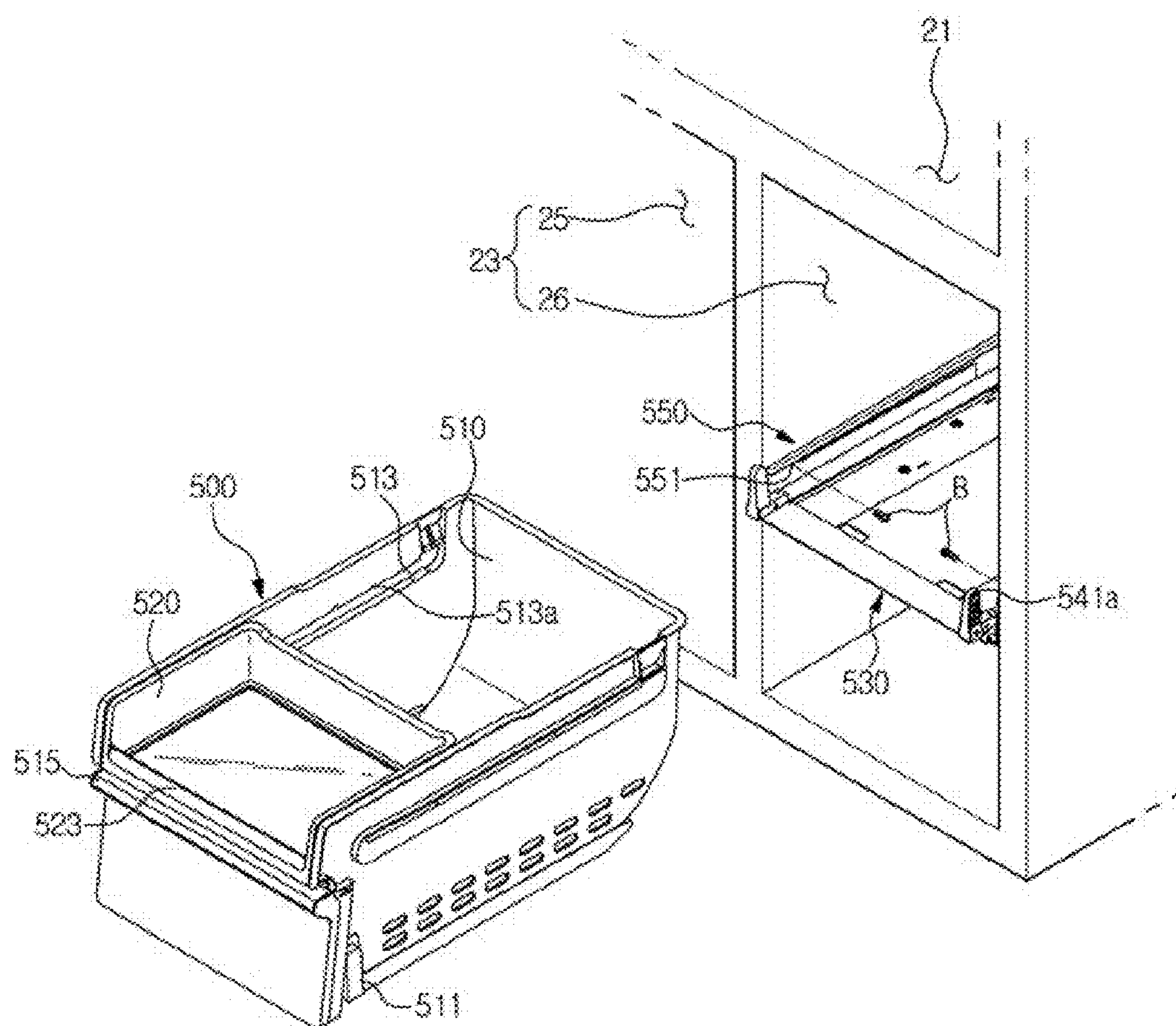


FIG. 23

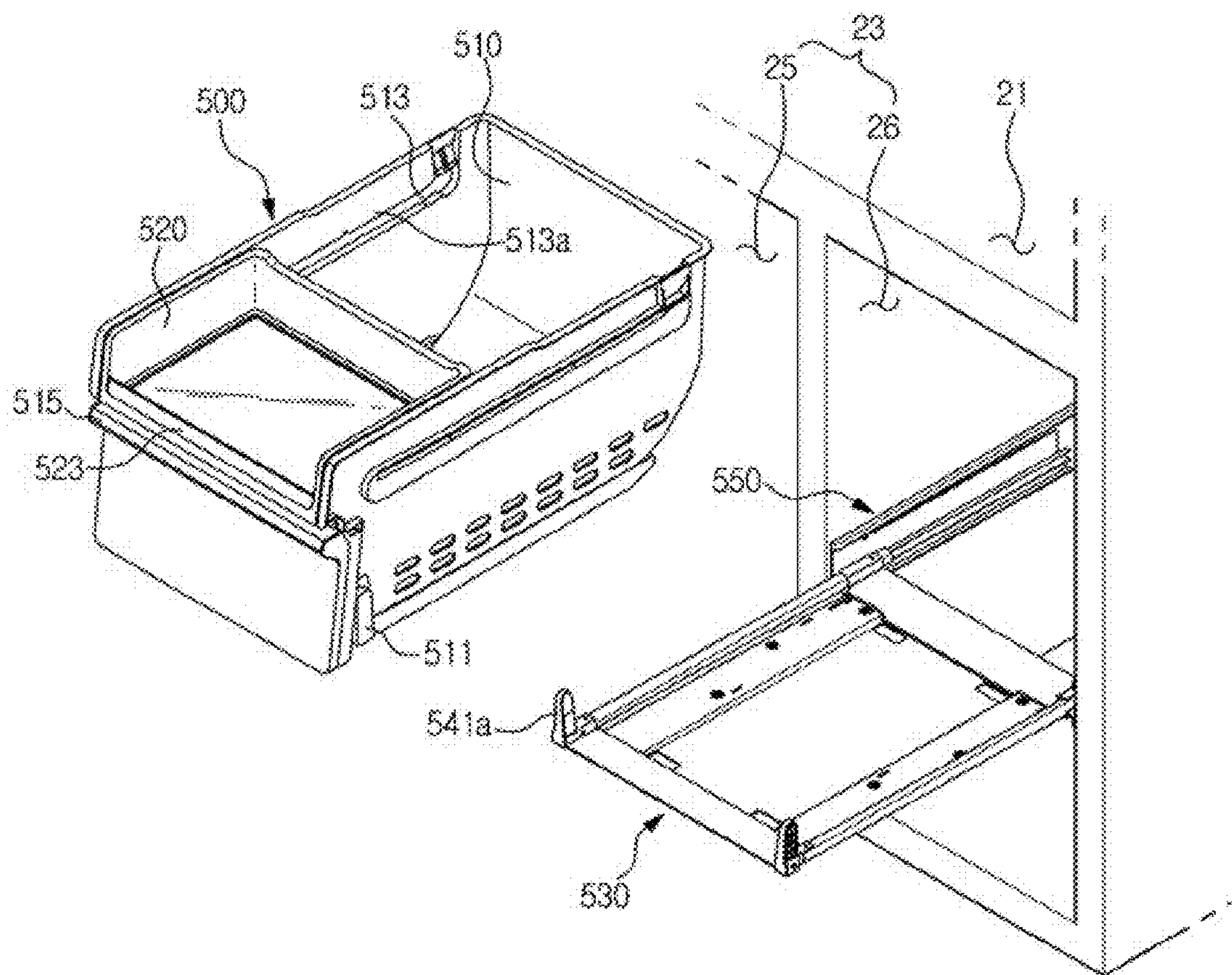


FIG. 24

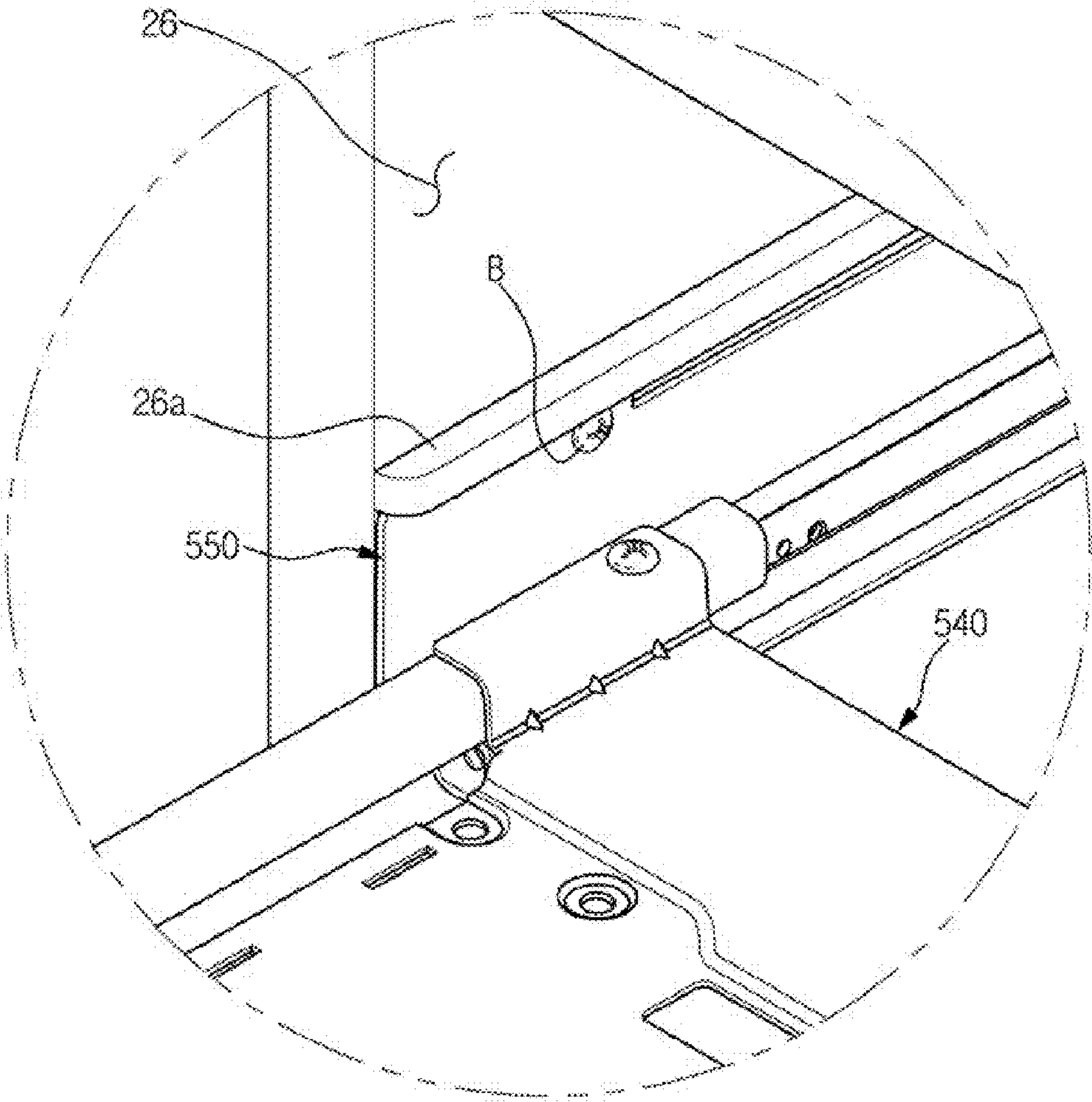


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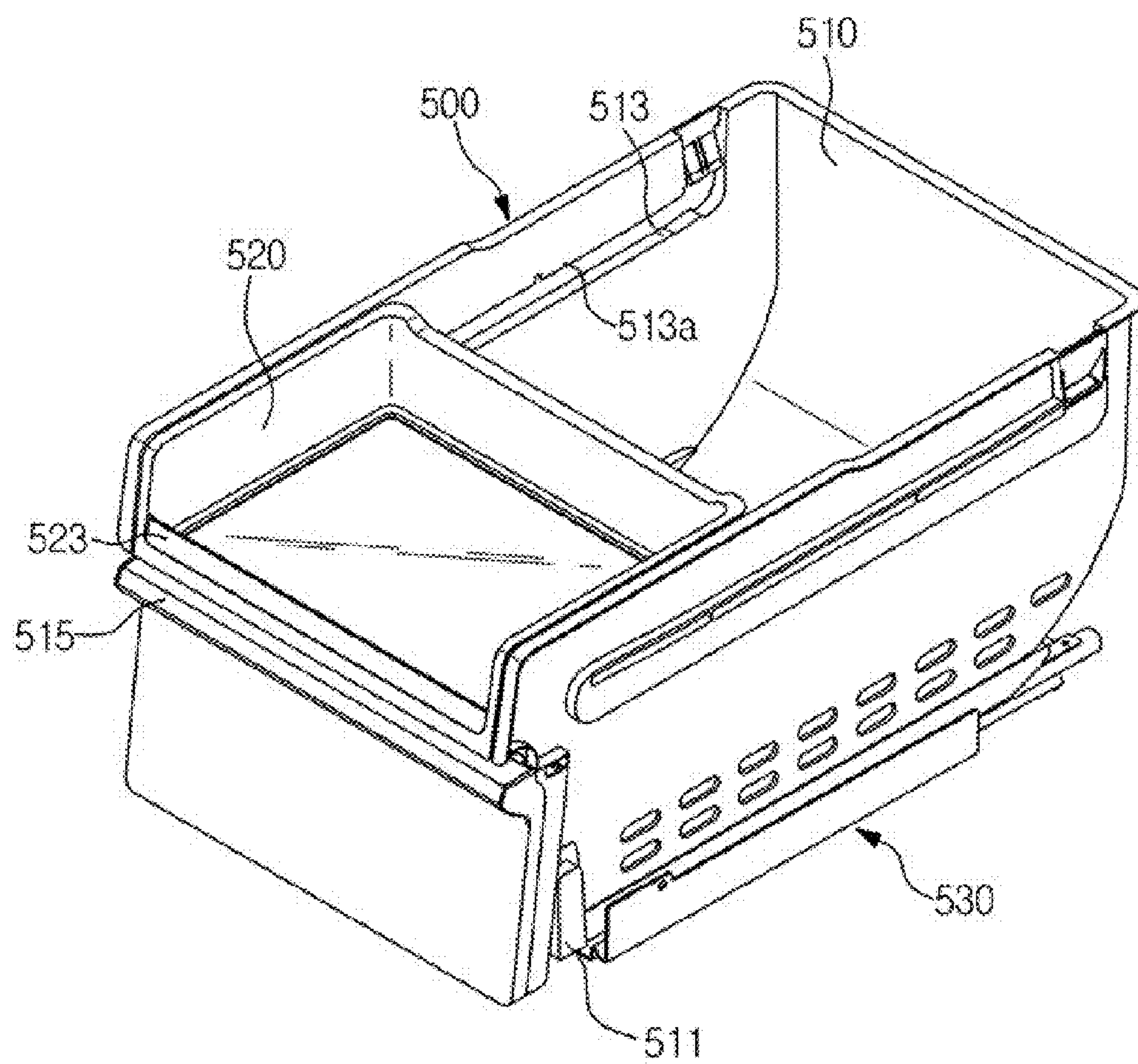


FIG. 26

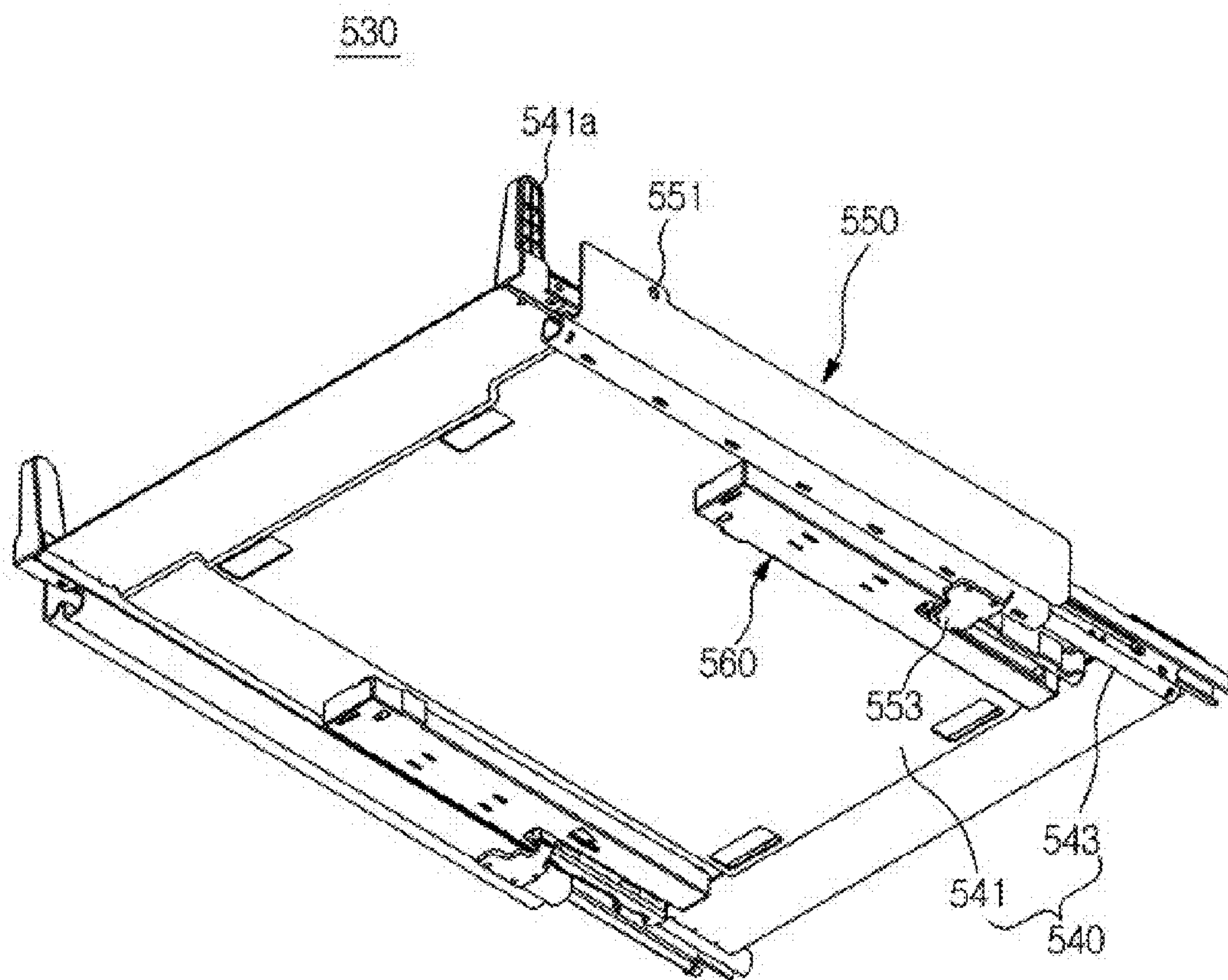


FIG. 27

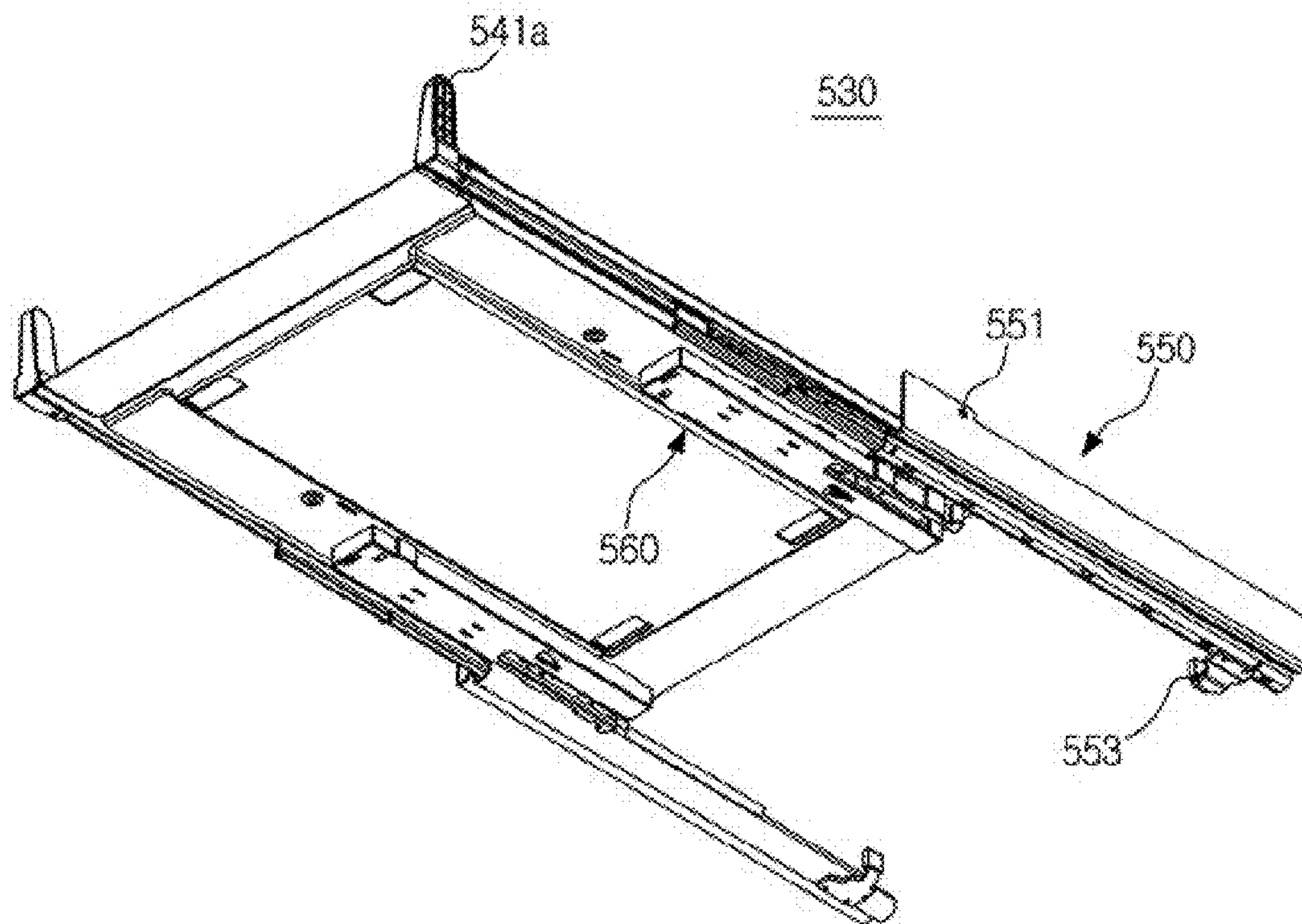


FIG. 28

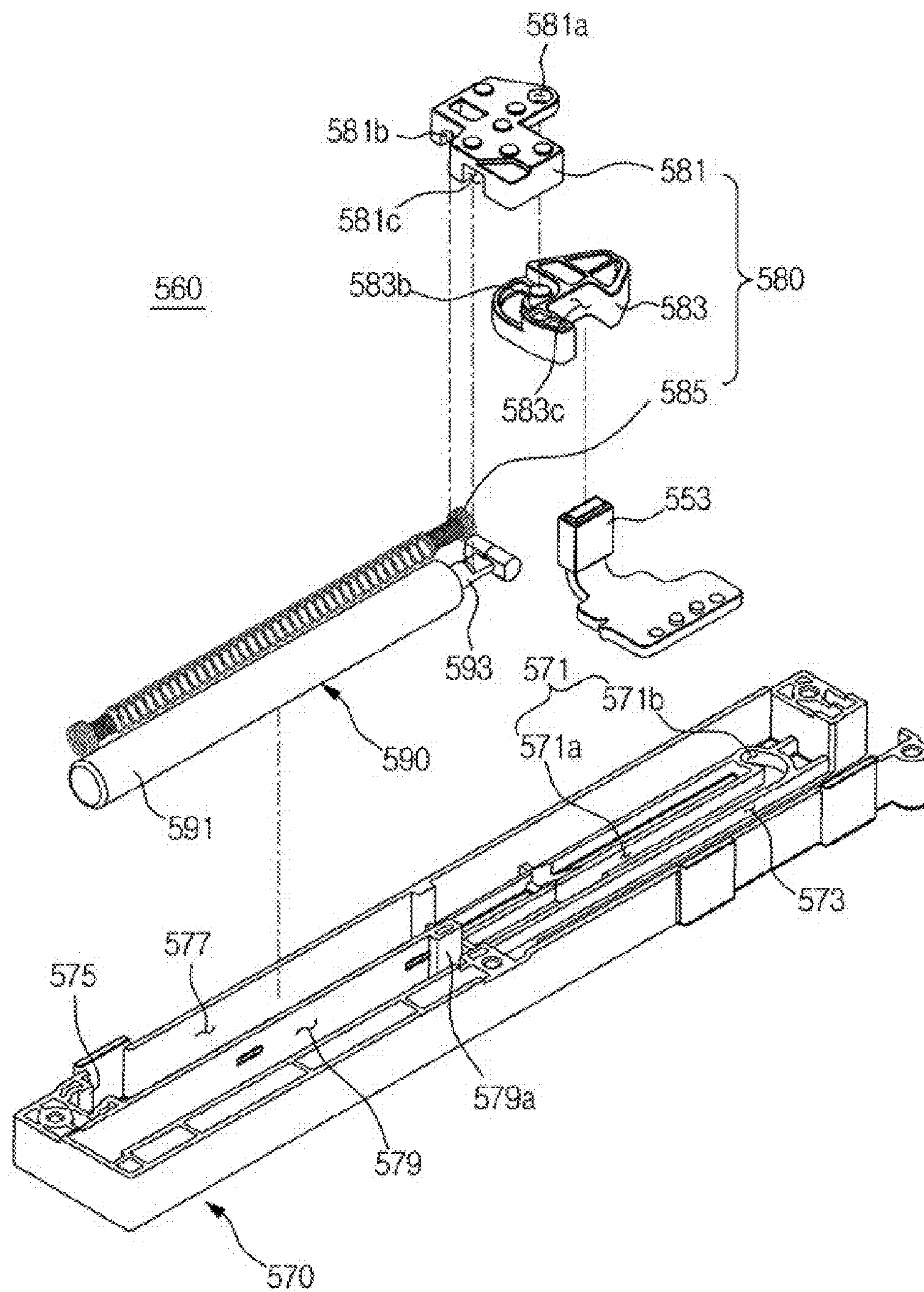


FIG. 29

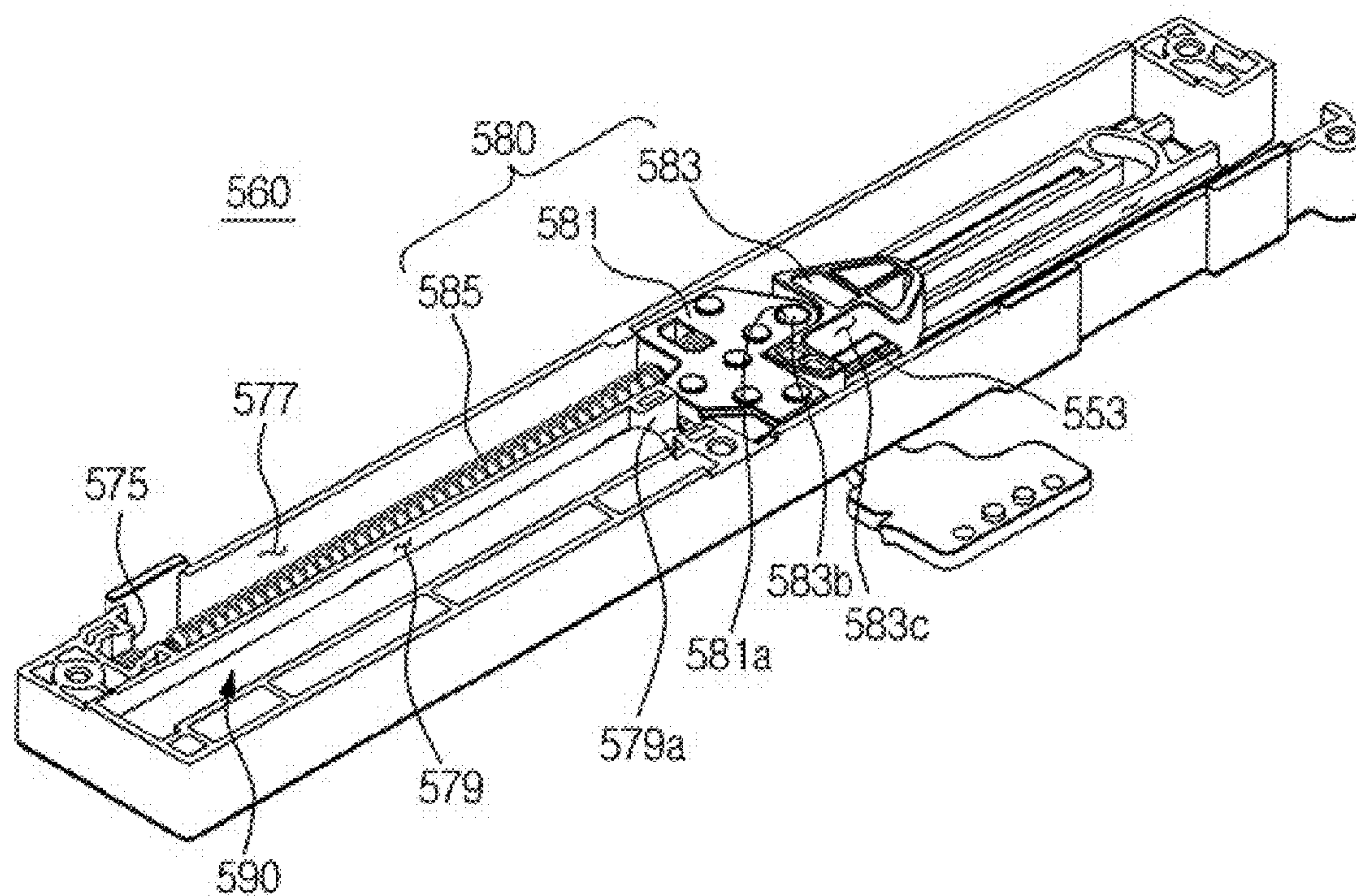


FIG. 30

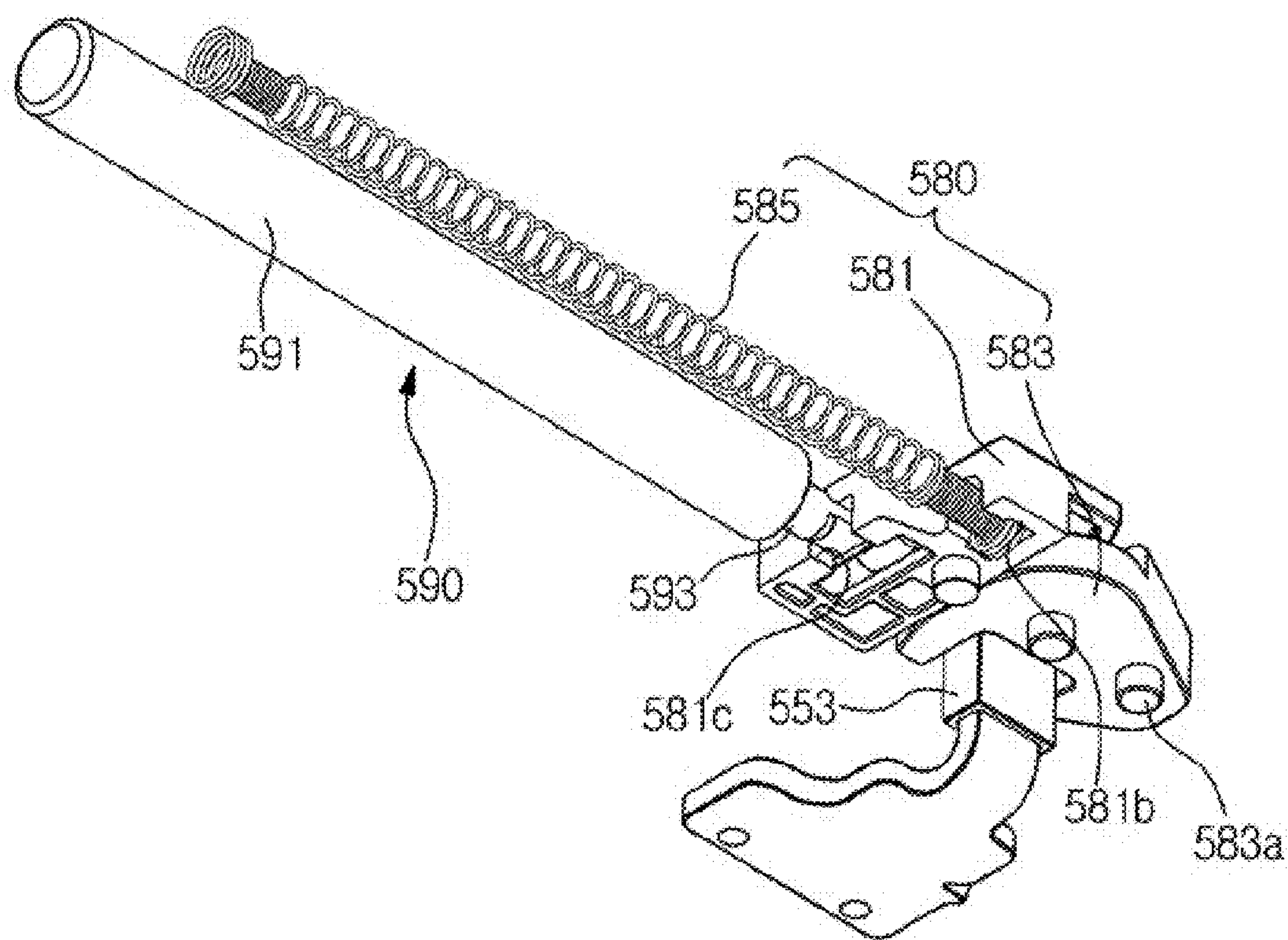


FIG. 31

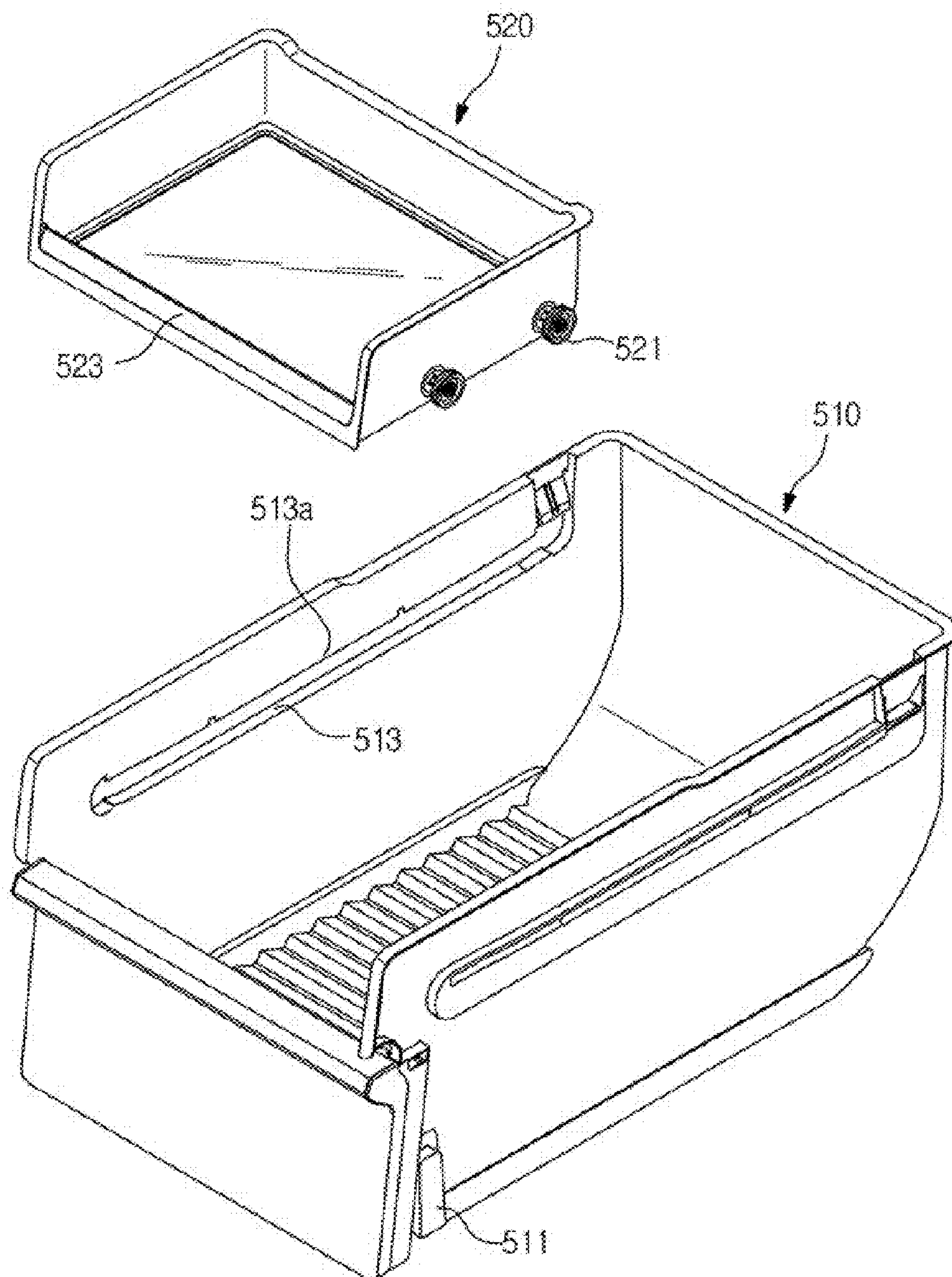


FIG. 32

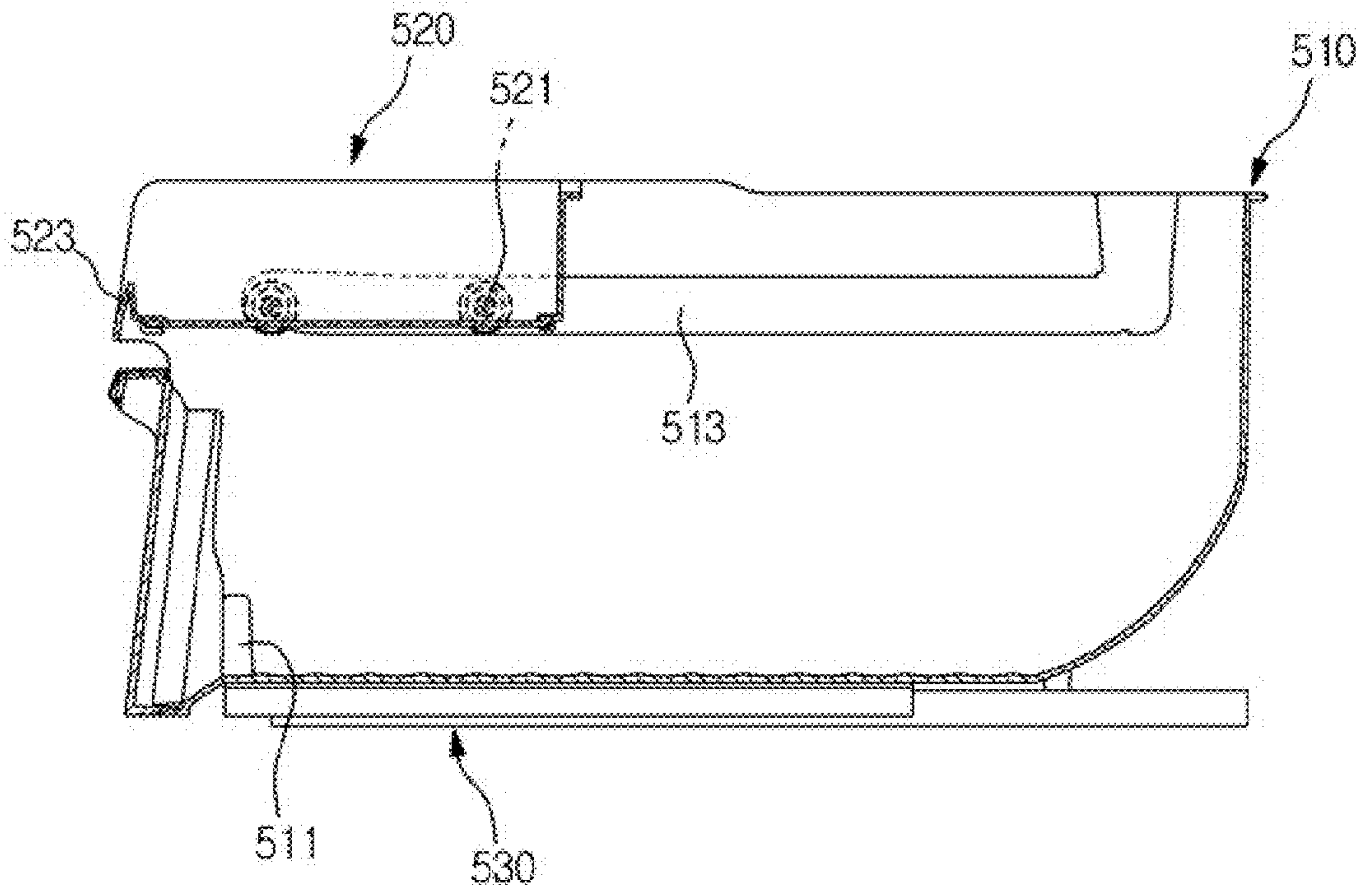


FIG. 33

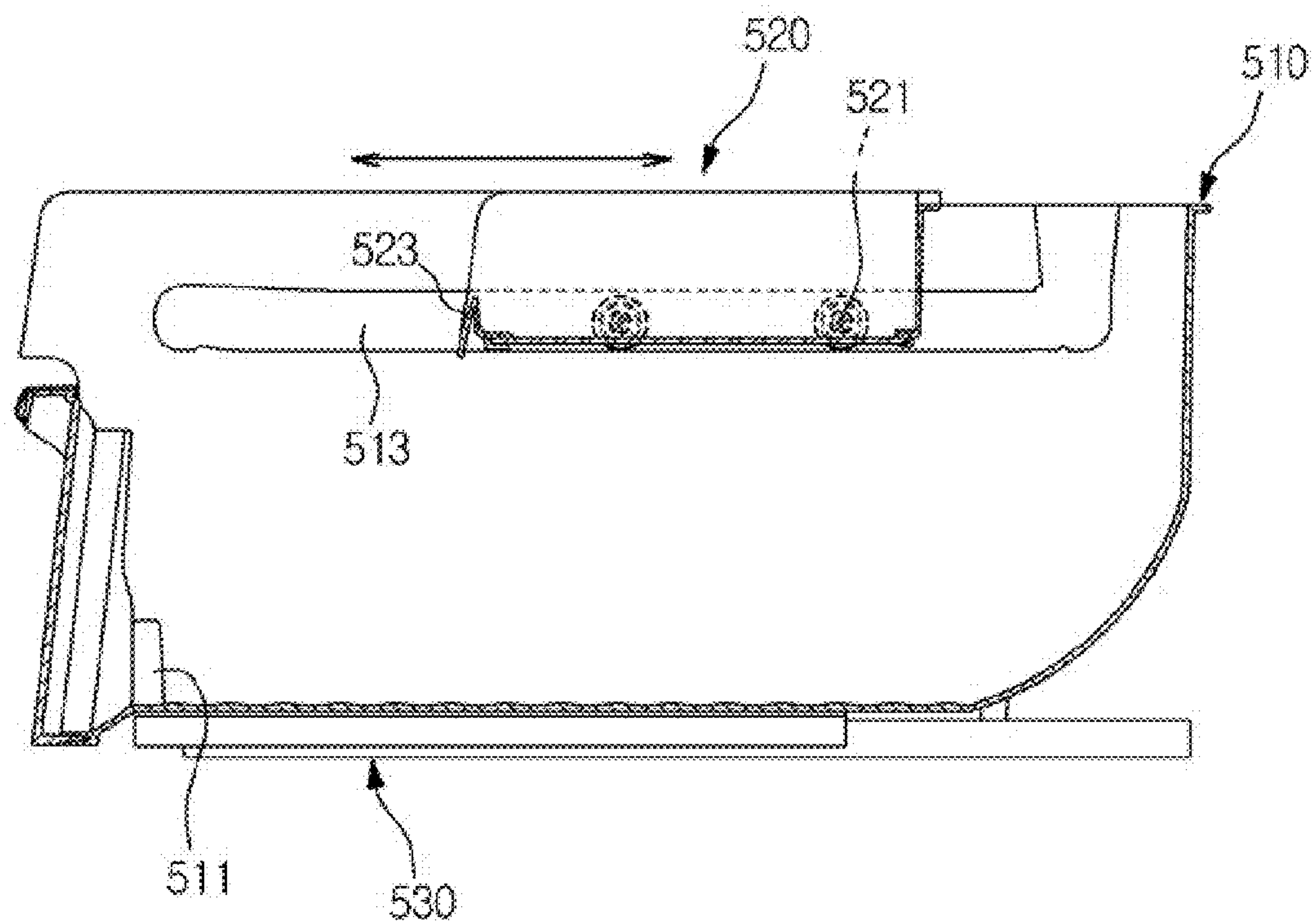


FIG. 34

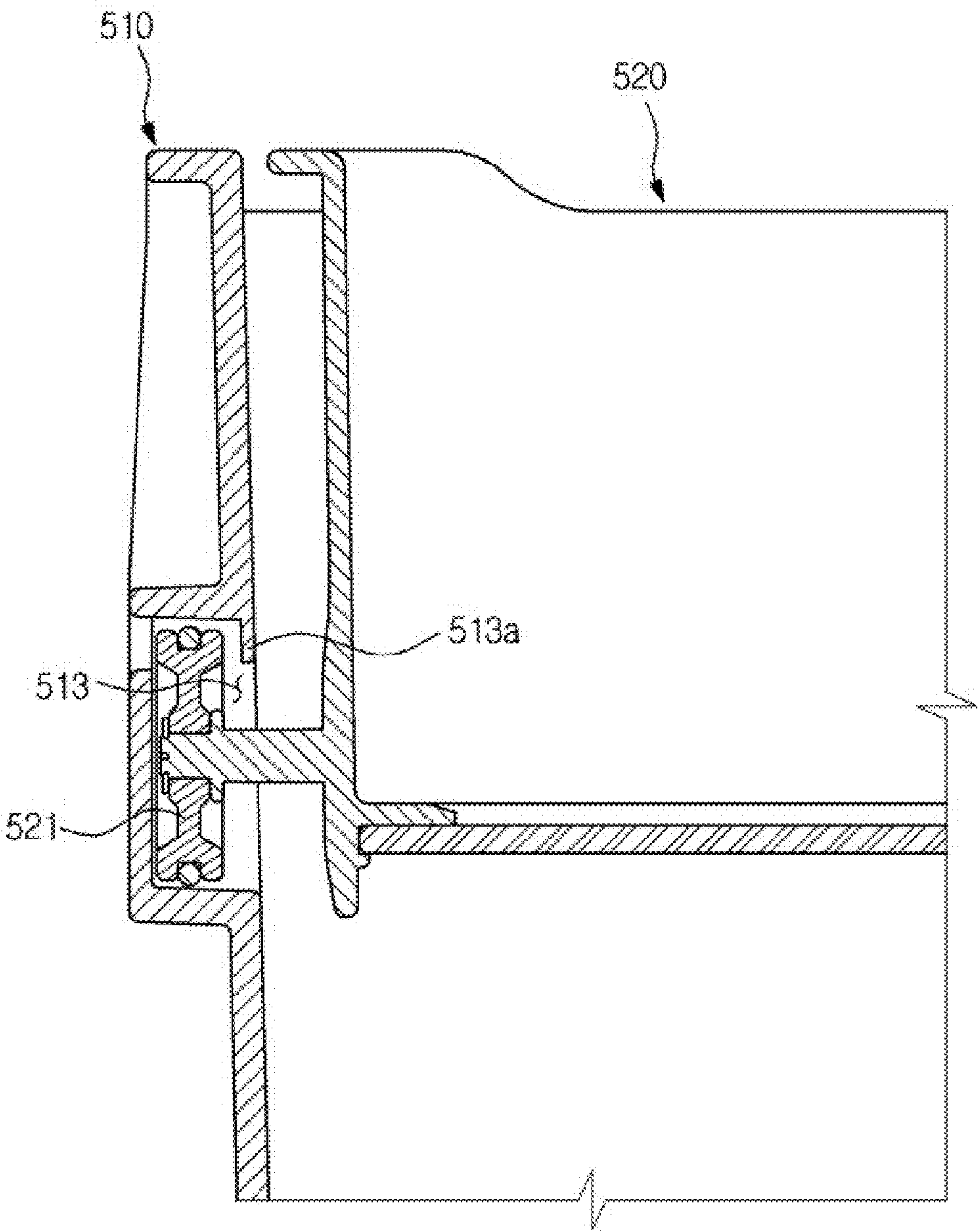


FIG. 35

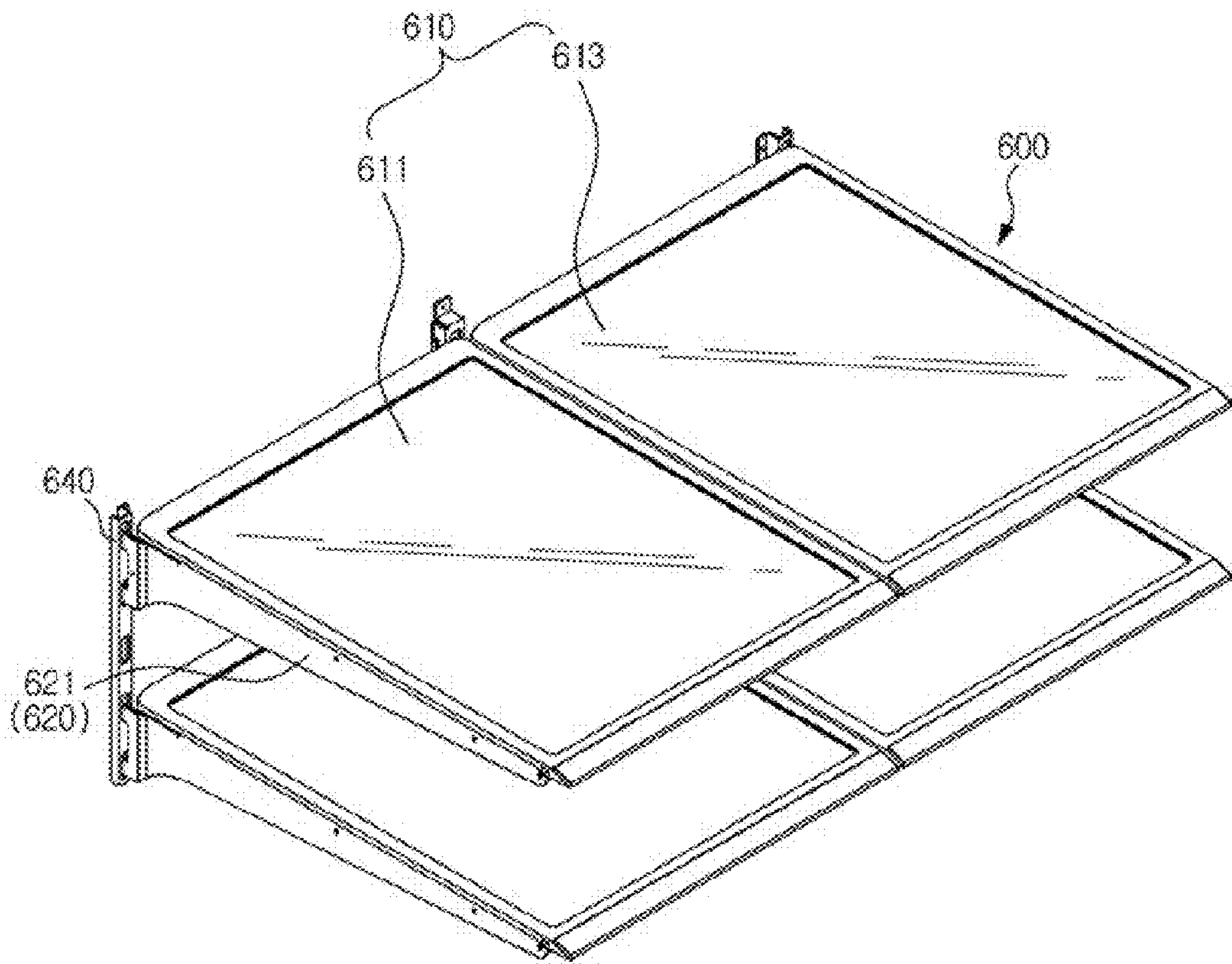


FIG. 36

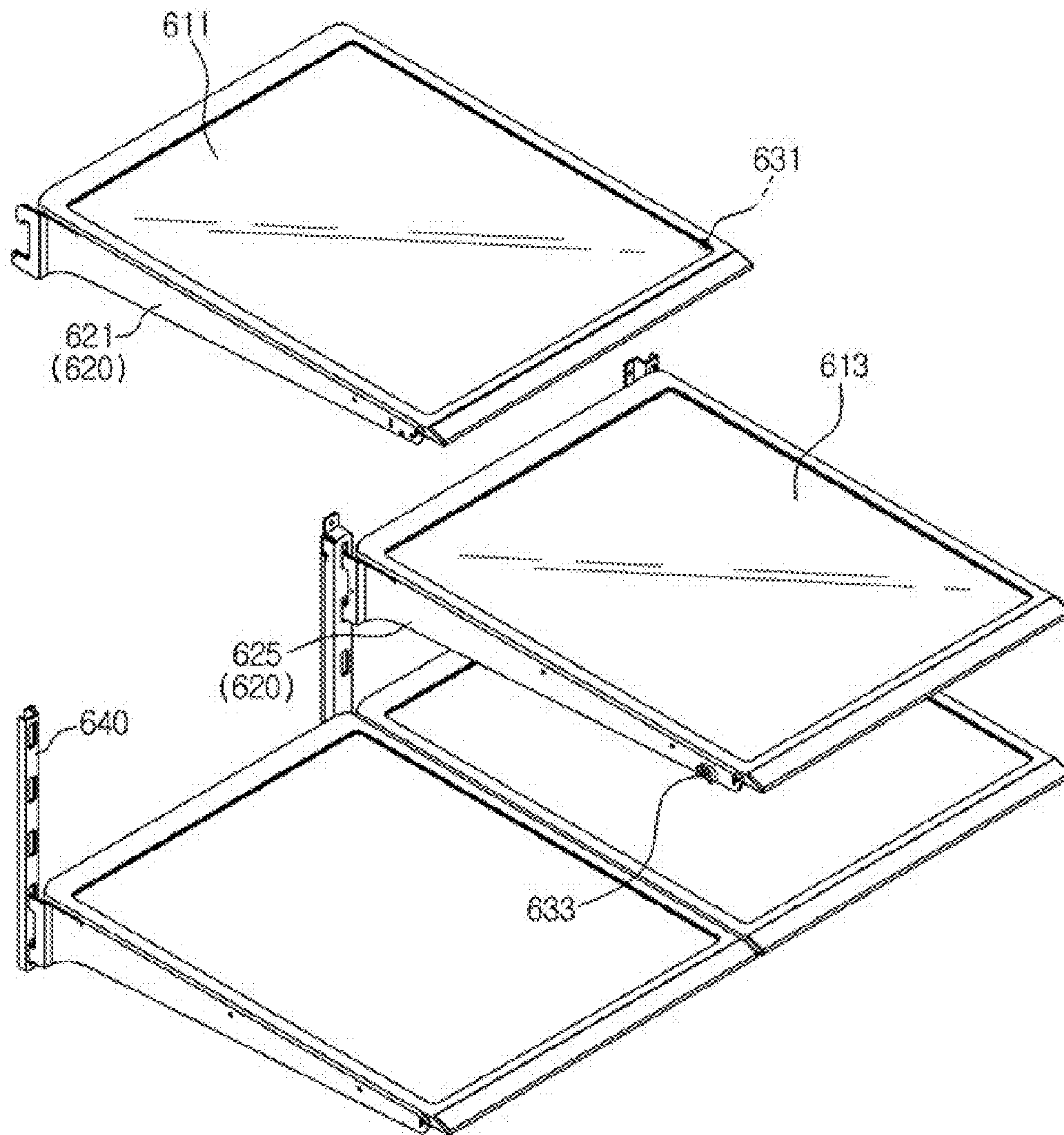


FIG. 37

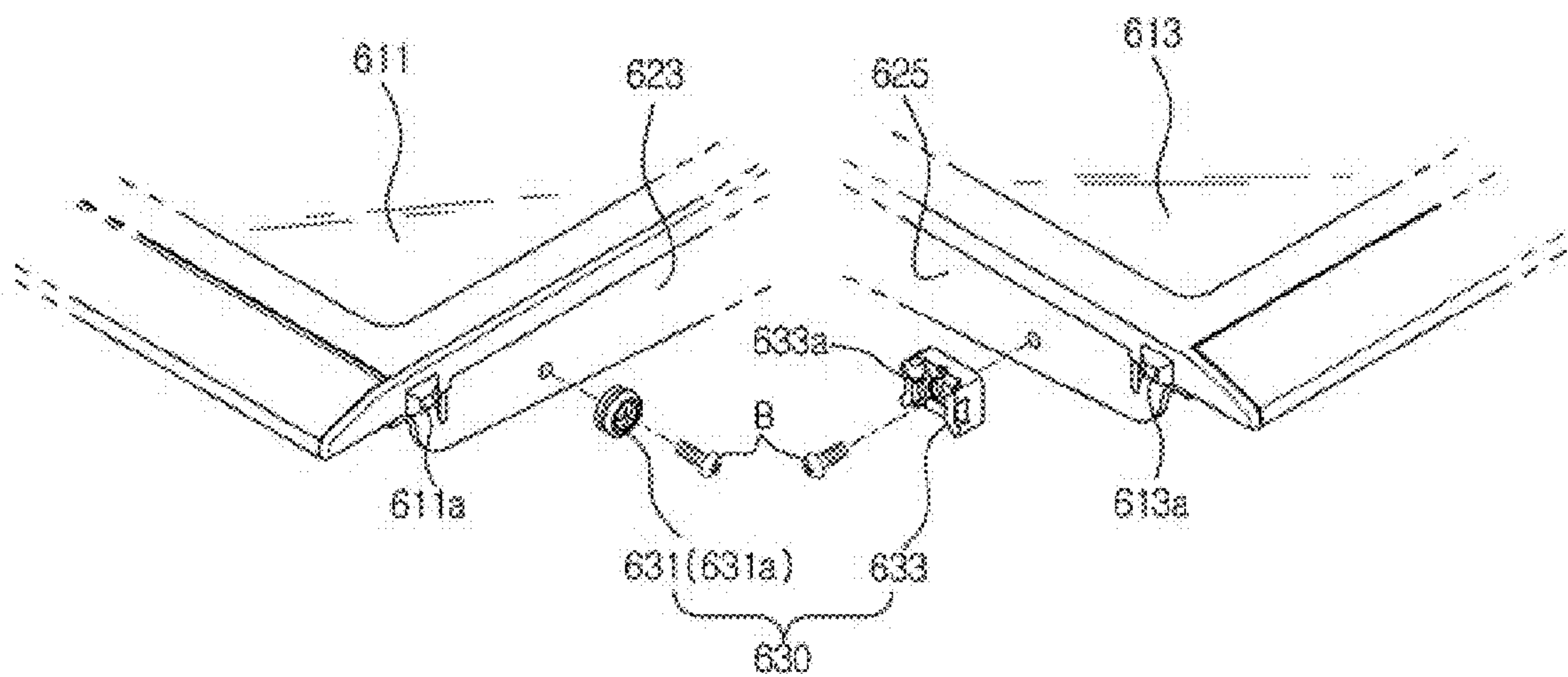


FIG. 38

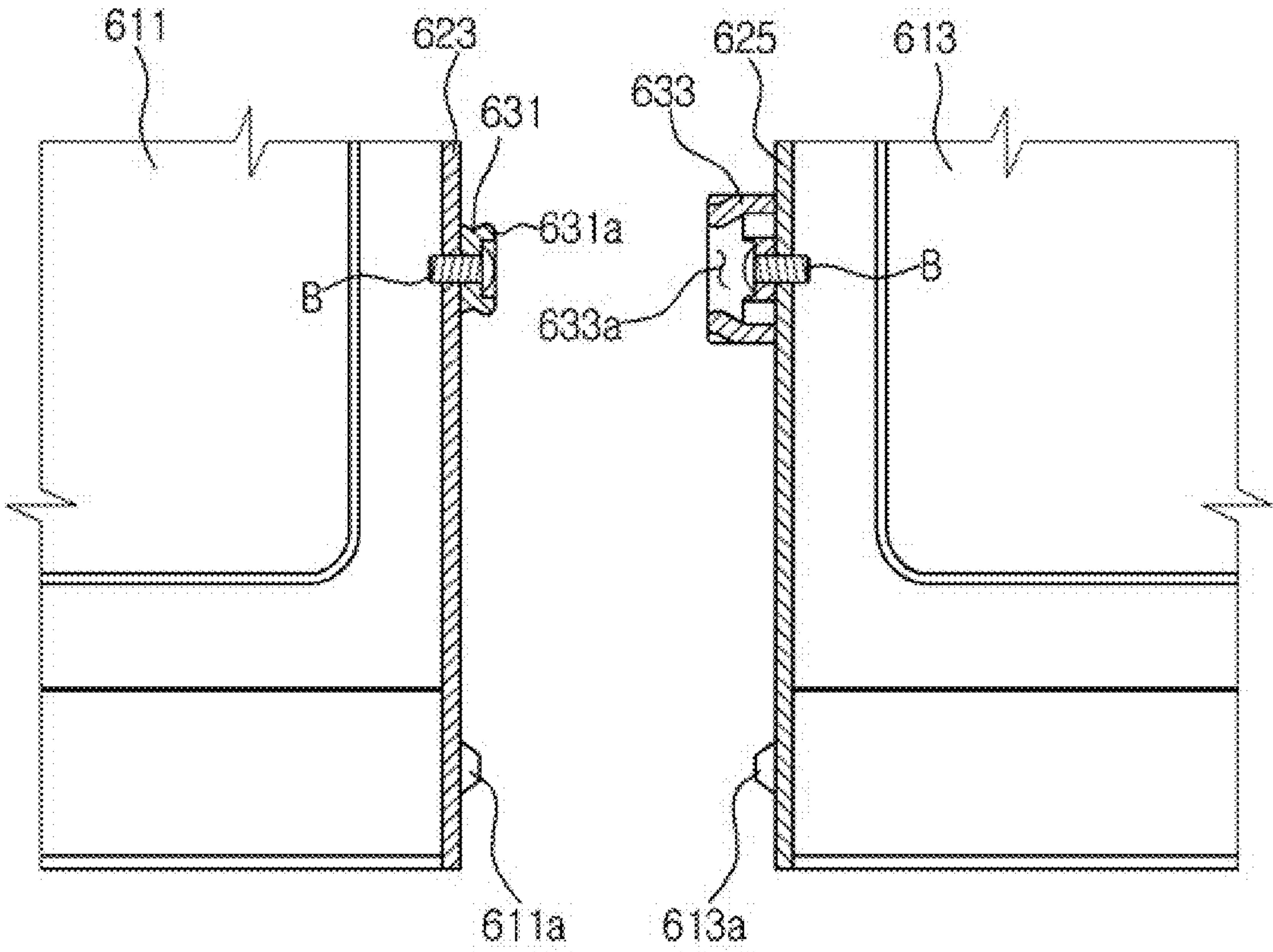


FIG. 39

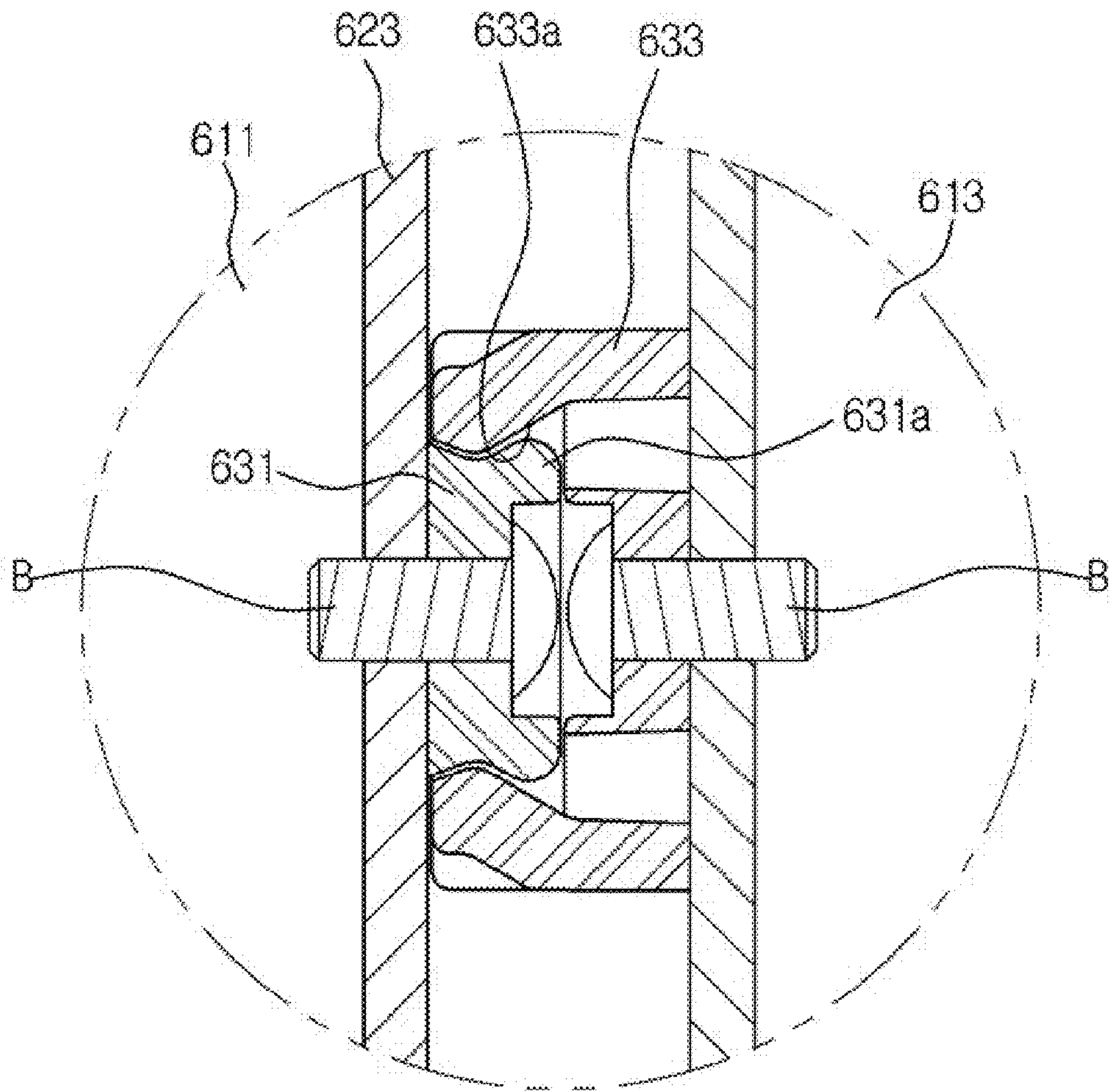


FIG. 40

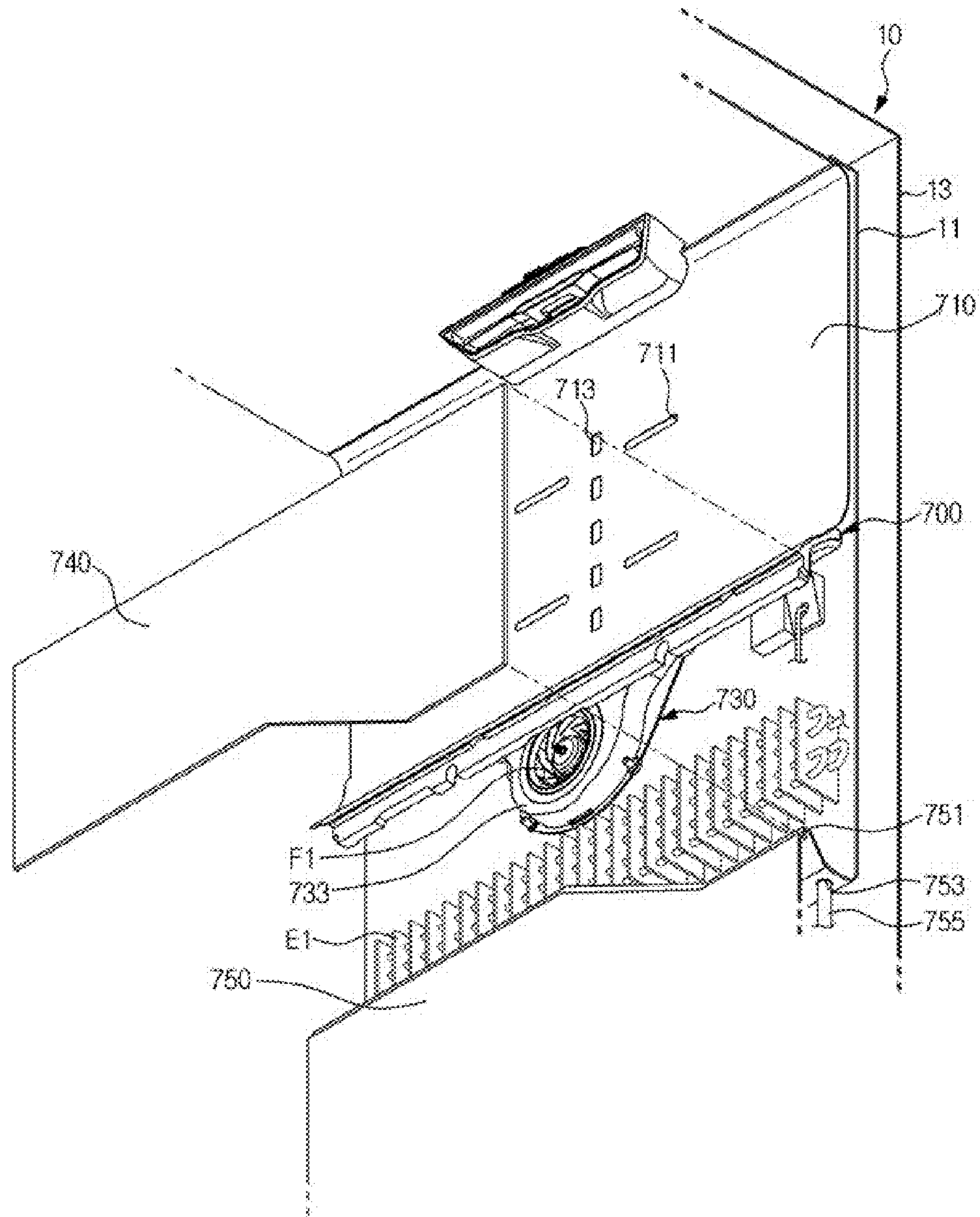


FIG. 41

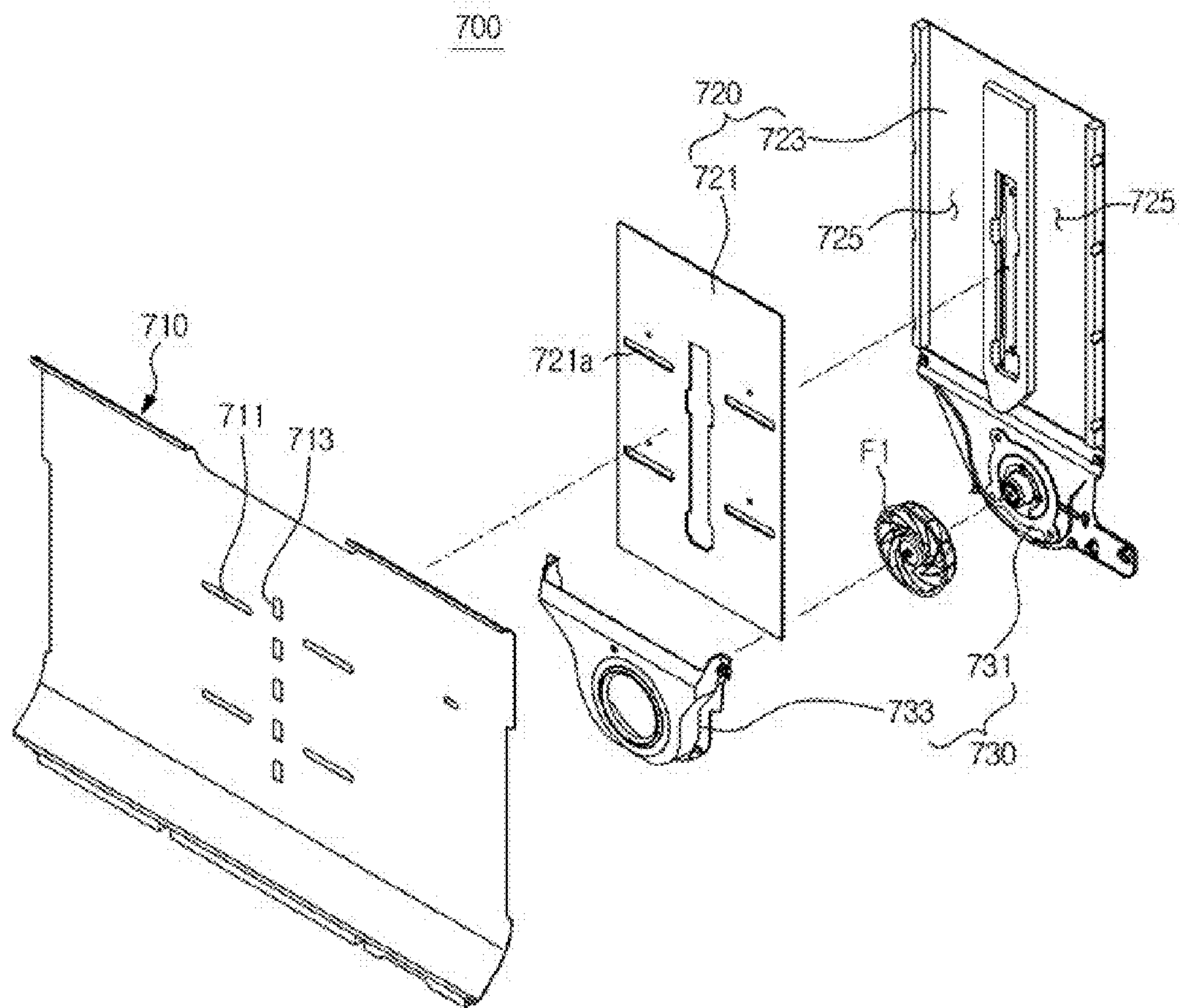


FIG. 42

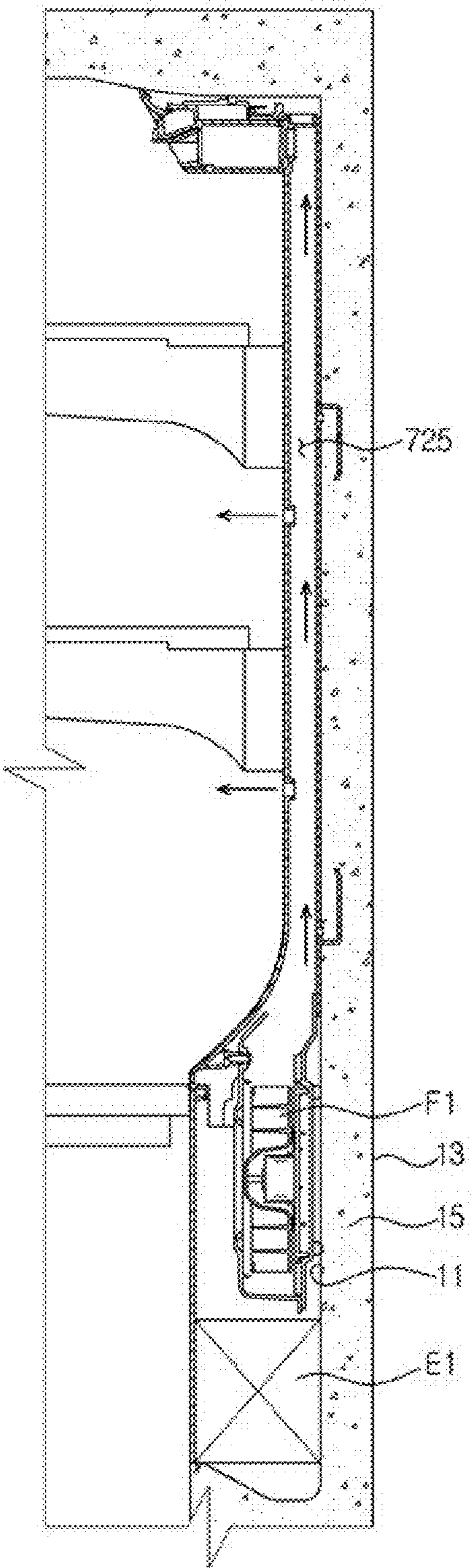


FIG. 43

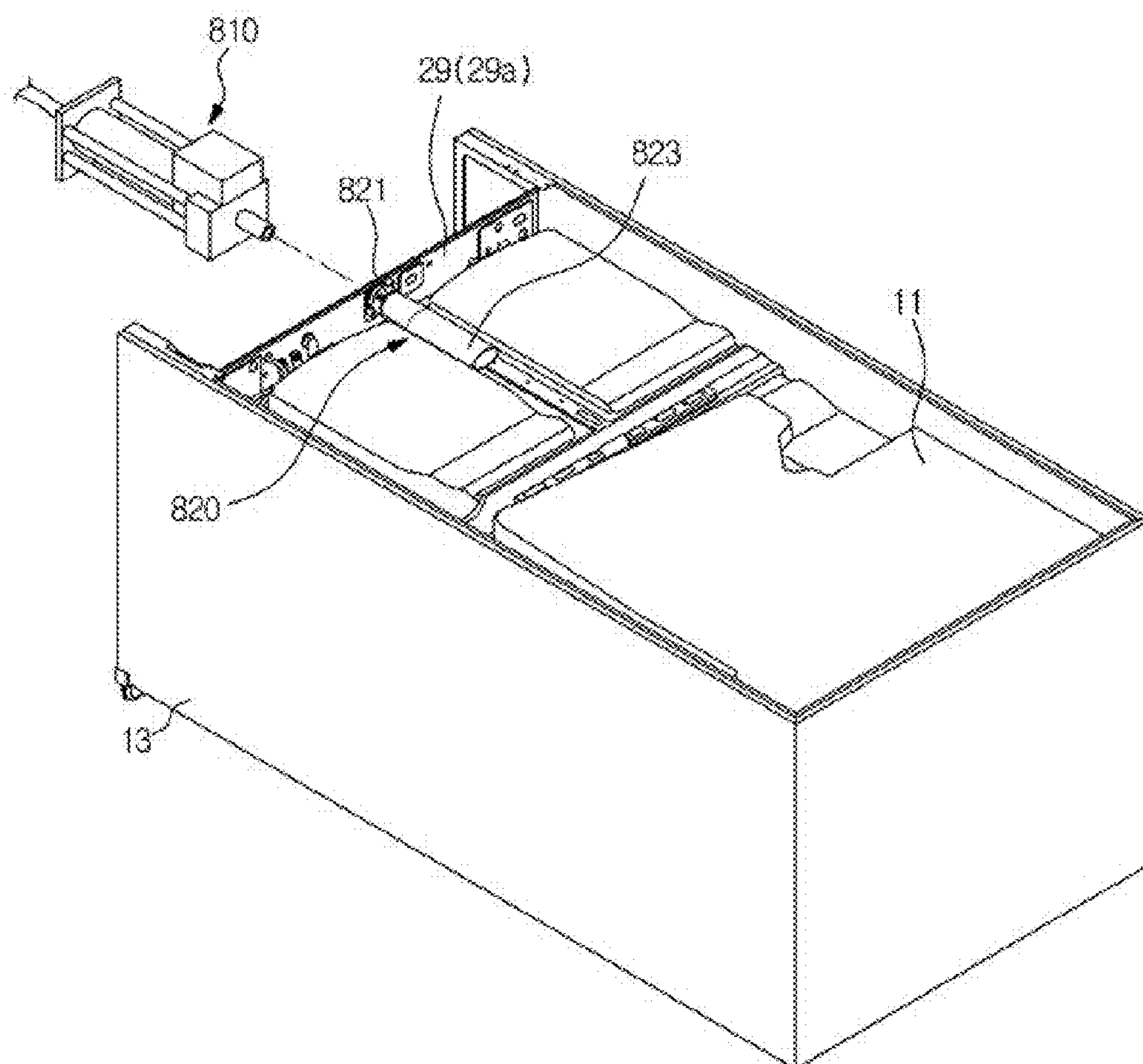


FIG. 44

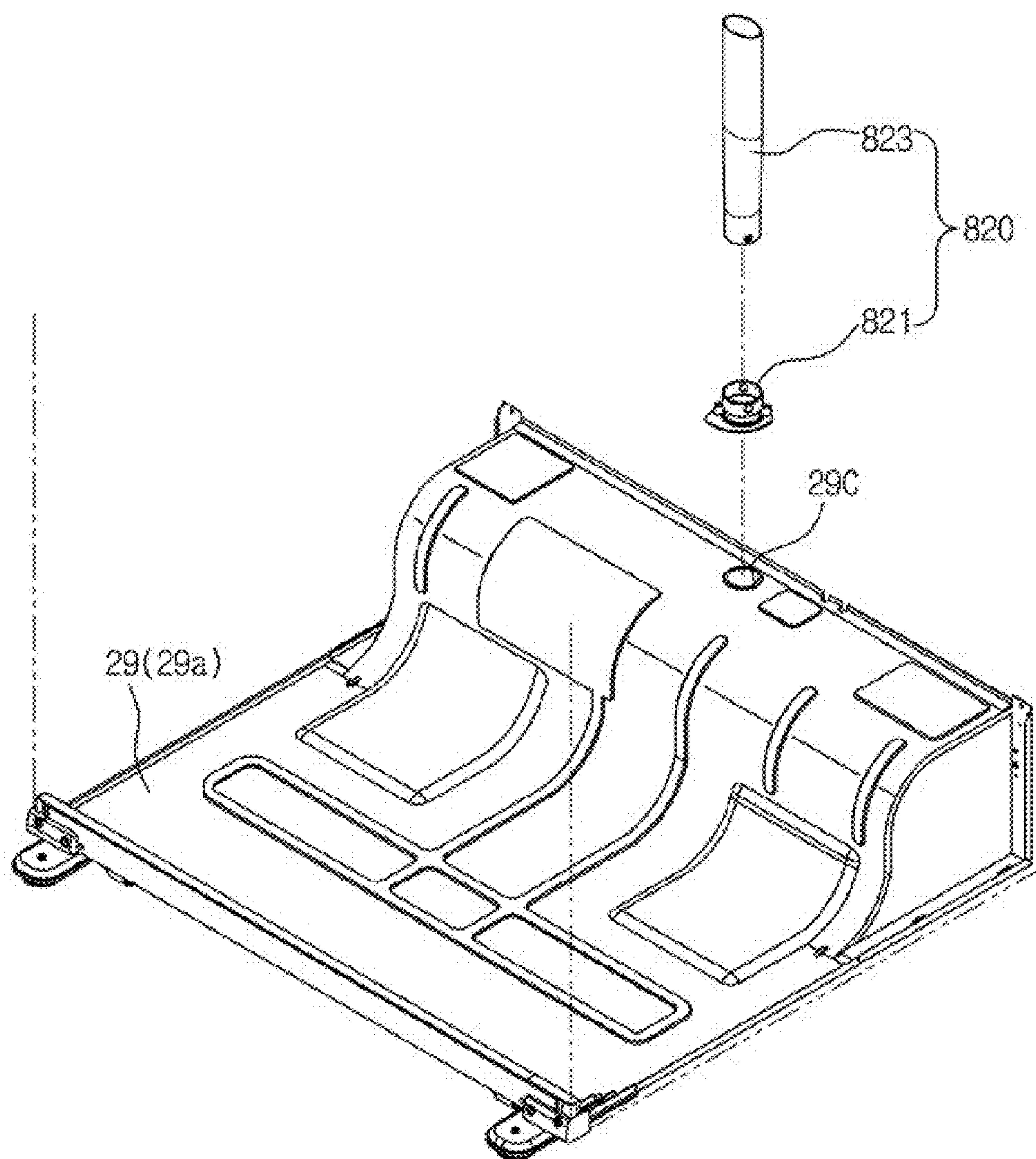


FIG. 45

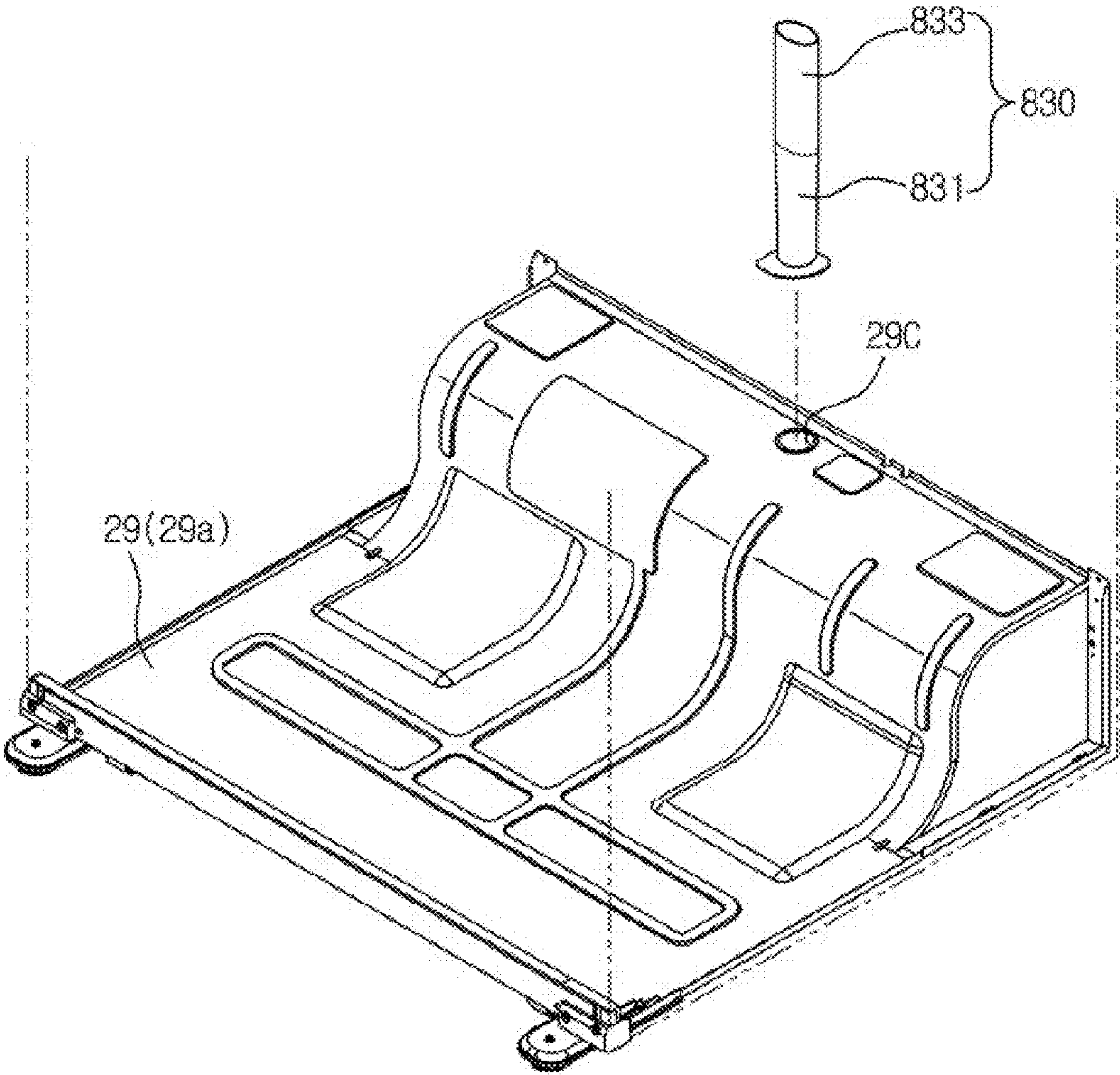


FIG. 46

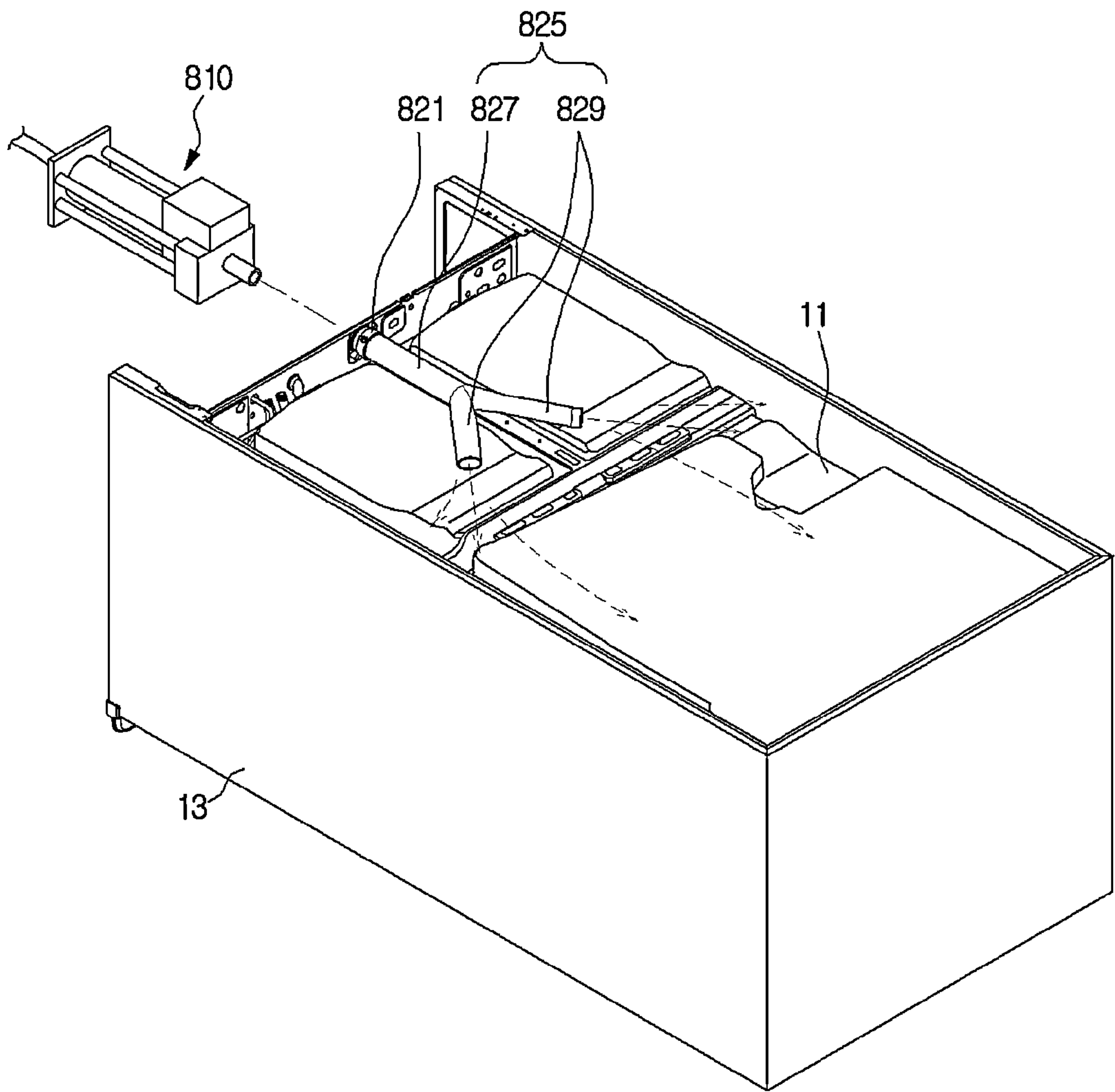


FIG. 47

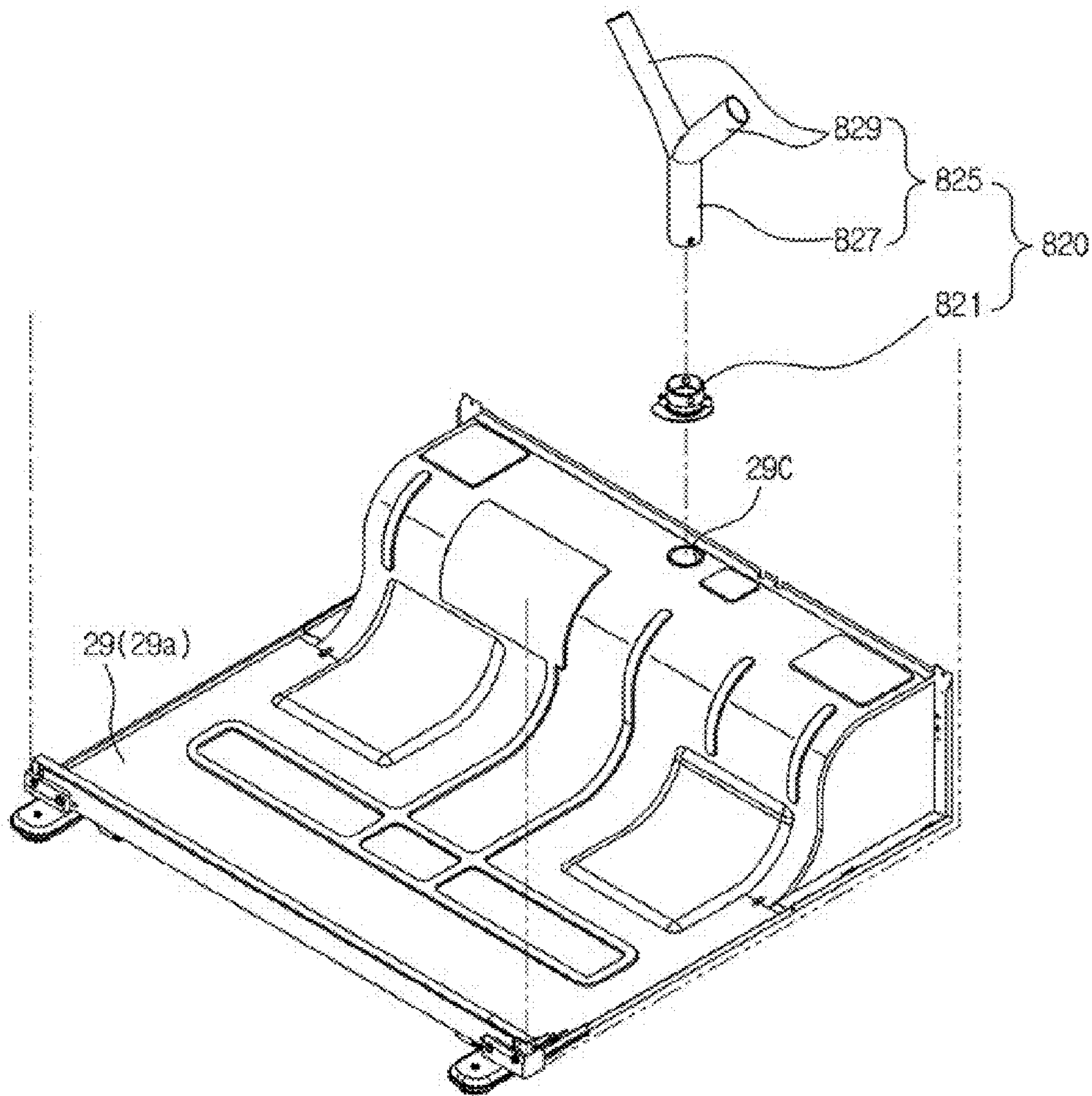


FIG. 48

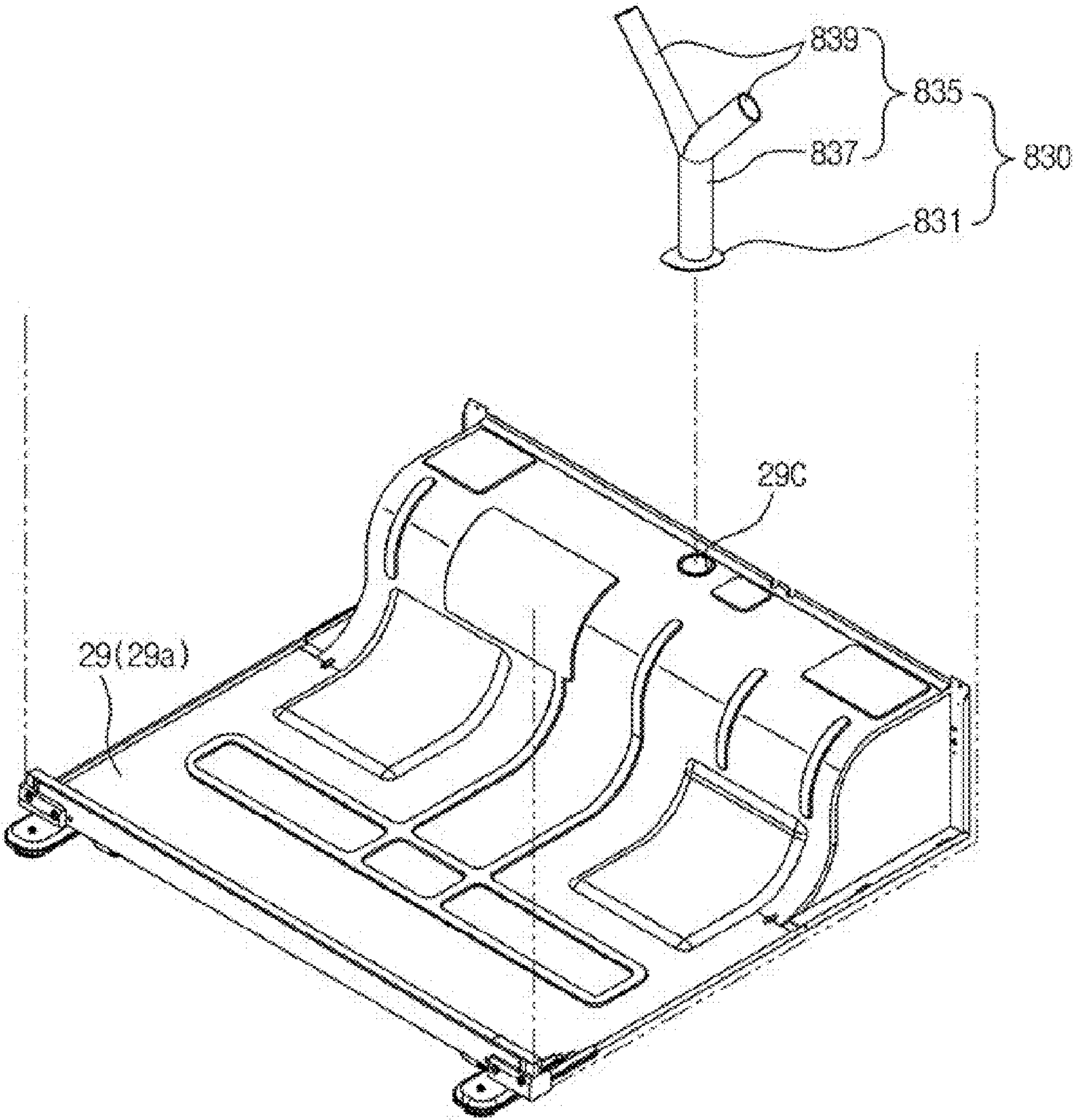
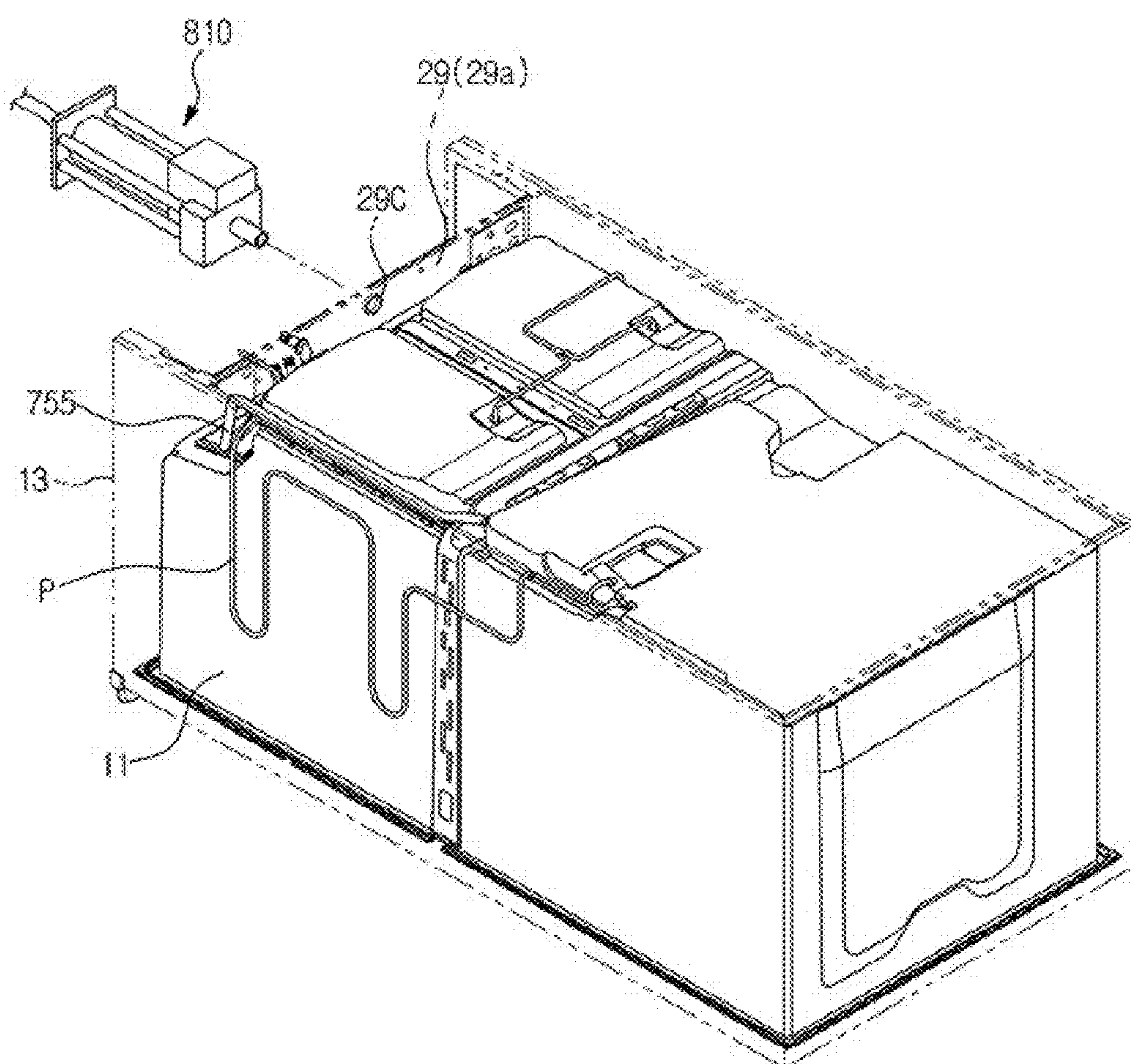


FIG. 49



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REFRIGERATOR

CROSS-REFERENCE TO RELATED APPLICATIONS

This application claims the priority benefit of Korean Patent Application No. 10-2014-0002010 filed on Jan. 7, 2014, and No. 10-2014-0089566 filed on Jul. 16, 2014, respectively, in the Korean Intellectual Property Office, the disclosures of each of which are incorporated herein by reference.

BACKGROUND

1. Field

Embodiments of the disclosure herein relate to a refrigerator that reinforces the strength of a body so as to prevent deformation.

2. Description of the Related Art

In general, a refrigerator refers to a device that keeps food fresh by including a body having an inner case and an outer case, a storage compartment formed by the inner case, and a cold air supplying unit for supplying cold air to the storage compartment.

The storage compartment may be maintained at a temperature in a predetermined range required to keep food fresh.

A front side of the storage compartment of the refrigerator may be disposed to be open, and the open front side of the storage compartment may be closed by a door so that the temperature of the storage compartment may be normally maintained.

An insulating material is foamed between the inner case and the outer case so as to prevent outflow of cold air in the storage compartment.

Since foaming of the insulating material is performed only at a predetermined temperature or higher, heat is generated while the insulating material is foamed. The body has a temperature approximately 20° C. higher than a room temperature in a state in which the insulating material is foamed between the inner case and the outer case.

After the insulating material is foamed between the inner case and the outer case, the temperature of the body is lowered to the room temperature so that the insulating material is solidified and the body thermally contracts.

Since the inner case is mainly formed of a plastic material and the outer case is mainly formed of a steel material and the plastic material has an approximately five times larger quantity of thermal contraction than that of the steel material, when the body thermally contracts, the inner case contracts greatly compared to the outer case and thus, while the temperature of the body is lowered to the room temperature, central parts of both sides of the body are deformed in a convex shape toward an outside of the body. In a state in which the temperature of the body is lowered to the room temperature, the insulating material is solidified in a state in which the central parts of both sides of the body are deformed in the convex shape toward the outside of the body.

When deformation occurs in the inner case and the outer case due to a difference in quantities of thermal contraction of the inner case and the outer case, deformation that occurs in the inner case and the outer case is reduced to a predetermined degree due to the insulating material that contacts the inner case and the outer case. By reducing the thickness of the insulating material foamed between the inner case and the outer case in order to increase an internal capacity of the

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body having the same exterior size, a quantity of deformation in which the central parts of both sides of the body are deformed in the convex shape toward the outside of the body, is increased by the reduced thickness of the insulating material. Even after the insulating material is foamed, when the refrigerator operates, the temperature of the body is lowered such that the quantity of thermal contraction of the inner case is further increased and a quantity of deformation of the shape is increased.

In addition, when the thickness of the insulating material is reduced, insulation performance may be lowered, and rigidity may be deteriorated such that deformation may occur in the body due to the weight of the body and a load of a material stored in the body.

In order to improve the insulation performance lowered due to the reduced thickness of the insulating material, a vacuum insulating material may be disposed between the inner case and the outer case together with the insulating material. The vacuum insulating material may be disposed between the inner case and the outer case together with the insulating material so as to supplement the lowered insulation performance, but deteriorated rigidity is not supplemented.

SUMMARY

Therefore, it is an aspect of the disclosure to provide a refrigerator that is capable of reducing a quantity of deformation of a body by improving rigidity of the body that is lowered due to a thickness of insulation being reduced to increase an internal capacity of the body, using a reinforcement structure.

It is another aspect of the disclosure to provide a refrigerator in which an electric apparatus box in which electric apparatus components for controlling an operation of the refrigerator are accommodated, is disposed in a hinge cover disposed in the front of an upper portion of a body so that spatial utility may be improved.

It is still another aspect of the disclosure to provide a refrigerator in which, when a fire breaks out in components inside the electric apparatus box, a reinforcement plate formed of a steel material is disposed in the electric apparatus box so as to prevent the fire from being spread toward an outside of the electric apparatus box.

Additional aspects of the disclosure will be set forth in part in the description which follows and, in part, will be apparent from the description, or may be learned by practice of the disclosure.

In accordance with an aspect of the disclosure, there is provided a refrigerator which may include a body including an inner case in which a storage compartment is formed, an outer case that is coupled to an outside of the inner case and constitutes an exterior, and an insulating material foamed between the inner case and the outer case, and a reinforcement member that is disposed between the inner case and the outer case of both sides of the body and prevents deformation of the body, wherein the reinforcement member is attached to the inner case so as to be disposed at both sides of the body in a widthwise direction.

The reinforcement member may include a first reinforcement member disposed at an upper portion of both sides of the body and a second reinforcement member disposed at a lower portion of both sides of the body.

The reinforcement member may be disposed to have a thickness of about 0.5 mm.

The reinforcement member may be disposed to have a cross-section in a shape of unevenness between the inner

case and the outer case, the cross-section having a larger thickness than that of the reinforcement member and a smaller height than a distance between the inner case and the outer case.

In accordance with an aspect of the disclosure, there is provided a refrigerator which may include an inner case in which a storage compartment is formed, an outer case that is coupled to an outside of the inner case and constitutes an exterior, an insulating material foamed between the inner case and the outer case, and a reinforcement member that is disposed between the inner case and the outer case and prevents deformation of the inner case and the outer case that occurs when the insulating material is foamed and then is solidified due to a difference in quantities of thermal contraction of the inner case and the outer case.

The reinforcement member may be disposed to correspond to a direction in which the insulating material is foamed between the inner case and the outer case and flows.

The reinforcement member may be disposed at both sides of the inner case in a widthwise direction and may be attached to the inner case.

The reinforcement member may be disposed at both sides of the outer case in a widthwise direction and may be attached to the outer case.

The reinforcement member may be disposed at both sides of the inner case in a lengthwise direction and may be attached to the inner case.

The reinforcement member may be disposed at both sides of the outer case in a lengthwise direction and may be attached to the outer case.

In accordance with an aspect of the disclosure, there is provided a refrigerator which may include an inner case in which a storage compartment is formed, an outer case that is coupled to an outside of the inner case and constitutes an exterior, an insulating material foamed between the inner case and the outer case, and a reinforcement member that is disposed between the inner case and the outer case so as to be disposed at both sidewalls of the inner case so that deformation that occurs in a lateral direction of the inner case and the outer case when the insulating material is foamed and then is solidified due to a difference in quantities of thermal contraction between the inner case and the outer case, is prevented.

The reinforcement member may be disposed to correspond to a direction in which the insulating material is foamed between the inner case and the outer case and flows.

The reinforcement member may be disposed at both sides of the inner case in a widthwise direction and may be attached to the inner case or outer case using an adhesive.

The reinforcement member may be disposed at both sides of the inner case in a lengthwise direction and may be attached to the inner case or outer case using an adhesive.

The reinforcement member may be disposed to have a thickness of about 0.5 mm and may be formed of steel.

The reinforcement member may be disposed to have a cross-section having an uneven shape, the cross-section having a larger thickness than a thickness of the reinforcement member and a smaller height than a distance between the inner case and the outer case.

The refrigerator may further include a reinforcement frame disposed at a front side of the refrigerator to supplement rigidity of the body, the reinforcement frame including at least one of an upper reinforcement frame coupled to an upper portion of the front side of the inner case, an intermediate reinforcement frame coupled to a central portion of the front side of the inner case, a lower reinforcement frame coupled to a lower portion of the front side of the inner case,

and a side reinforcement frame coupled to a lower side portion of the front side of the inner case.

In accordance with an aspect of the disclosure, there is provided a refrigerator including an inner case in which a storage compartment is formed, an outer case that is coupled to an outside of the inner case and constitutes an exterior, an insulating material disposed between the inner case and the outer case, and a reinforcement member disposed in the insulating material between the inner case and the outer case at a side of the body, and being attached to one of the inner case and the outer case. A portion of the reinforcement member may be attached to a side surface of one of the inner case and the outer case, and a portion of the reinforcement member may be bent away from the side surface of the one of the inner case and the outer case.

The refrigerator may further include a vacuum insulation panel disposed between the inner case and the outer case together with the insulating material, wherein the reinforcement member may be attached to the side surface of the inner case and may be bent away from the side surface of the inner case toward the vacuum insulation panel.

The reinforcement member may include a first reinforcement member disposed at an upper portion of the side of the body and a second reinforcement member disposed at a lower portion of the side of the body, and the first reinforcement member and the second reinforcement member may each be disposed in a widthwise direction of the side of the body and each have a length in the widthwise direction which is less than a length of the side of the body in the widthwise direction.

The reinforcement member may be disposed in a lengthwise direction of the side of the body and may have a length in the lengthwise direction which is less than a length of the side of the body in the lengthwise direction.

The refrigerator may further include a reinforcement frame disposed at a front side of the refrigerator to supplement rigidity of the body, the reinforcement frame including at least one of an upper reinforcement frame coupled to an upper portion of the front side of the inner case, an intermediate reinforcement frame coupled to a central portion of the front side of the inner case, a lower reinforcement frame coupled to a lower portion of the front side of the inner case, and a side reinforcement frame coupled to a lower side portion of the front side of the inner case.

BRIEF DESCRIPTION OF THE DRAWINGS

These and/or other aspects of the disclosure will become apparent and more readily appreciated from the following description of the embodiments, taken in conjunction with the accompanying drawings of which:

FIG. 1 is a perspective view of a refrigerator according to an embodiment of the disclosure;

FIG. 2 is a cross-sectional view of a side of the refrigerator according to an embodiment of the disclosure;

FIG. 3 is a cross-sectional view of a front side of the refrigerator according to an embodiment of the disclosure;

FIG. 4 is a view of a state in which a reinforcement member according to an embodiment of the disclosure is attached to an inner case;

FIG. 5 is a cross-sectional view of a state in which a first reinforcement member according to an embodiment of the disclosure is attached to the inner case;

FIG. 6 is a view of a state in which the reinforcement member according to an embodiment of the disclosure is attached to an outer case;

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FIG. 7 is a view of a state in which the reinforcement member according to an embodiment of the disclosure is attached to the inner case in a lengthwise direction;

FIG. 8 is a view of a state in which a reinforcement frame according to an embodiment of the disclosure is coupled to a body;

FIG. 9 is a perspective view of the reinforcement frame according to an embodiment of the disclosure;

FIG. 10 is an exploded perspective view of an electric apparatus box disposed on the refrigerator according to an embodiment of the disclosure;

FIG. 11 is an exploded perspective view of a state in which the electric apparatus box according to an embodiment of the disclosure is viewed in an upward direction;

FIG. 12 is a perspective view of the electric apparatus box according to an embodiment of the disclosure;

FIG. 13 is a cross-sectional view of a state in which the electric apparatus box according to an embodiment of the disclosure is disposed at the body;

FIG. 14 is a view of wires connected to the electric apparatus box according to an embodiment of the disclosure;

FIG. 15 is a schematic view of a state in which a heating pipe according to an embodiment of the disclosure is disposed at the body;

FIG. 16 is a view of the outer case and the inner case in which the heating pipe according to an embodiment of the disclosure is disposed;

FIG. 17 is a view of a state in which the heating pipe is fixed to the inner case according to an embodiment of the disclosure;

FIG. 18 is a view of a state in which a mounting portion for mounting the heating pipe and a fixing groove for fixing the heating pipe are disposed at the inner case according to an embodiment of the disclosure;

FIG. 19 is a view of a state in which the heating pipe according to an embodiment of the disclosure is disposed at the body;

FIG. 20 is a view of a state in which a storage unit is disposed in a storage compartment according to an embodiment of the disclosure;

FIG. 21 is a view of a state in which a sliding shelf according to an embodiment of the disclosure is coupled to an inside of the storage compartment;

FIG. 22 is a view of a state in which the sliding shelf according to an embodiment of the disclosure has been coupled to the inside of the storage compartment;

FIG. 23 is a view of a state in which a first storage box is coupled to the sliding shelf according to an embodiment of the disclosure;

FIG. 24 is an enlarged view of a portion in which a cover rail of FIG. 23 is coupled to a coupling portion;

FIG. 25 is a view of a state in which the sliding shelf is coupled to the first storage box according to an embodiment of the disclosure;

FIG. 26 is a view of a state in which the sliding shelf according to an embodiment of the disclosure is viewed from a bottom;

FIG. 27 is a view of a state in which a sliding portion is taken out from the sliding shelf of FIG. 26;

FIG. 28 is an exploded perspective view of a self closing unit according to an embodiment of the disclosure;

FIG. 29 is a view of the self closing unit according to an embodiment of the disclosure;

FIG. 30 is a view of a state in which a part of the self closing unit according to an embodiment of the disclosure is viewed from the bottom;

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FIG. 31 is a view of a state in which a first storage box and a second storage box according to an embodiment of the disclosure are separated from each other;

FIG. 32 is a view of a state in which a storage unit according to an embodiment of the disclosure is viewed from a side;

FIG. 33 is a view of a state in which the second storage box is moved in FIG. 32;

FIG. 34 is a view of a state in which the second storage box is disposed in the first storage box according to an embodiment of the disclosure;

FIG. 35 is a view of a shelf unit according to an embodiment of the disclosure;

FIG. 36 is a view of a state in which a first shelf is separated from a support portion in FIG. 35;

FIG. 37 is a view of a state in which a horizontal maintaining portion according to an embodiment of the disclosure is coupled to a bracket;

FIG. 38 is a view of a state in which the horizontal maintaining portion according to an embodiment of the disclosure is coupled to a shelf according to an embodiment of the disclosure;

FIG. 39 is a view of a state in which a fixing protrusion according to an embodiment of the disclosure is inserted into a fixing groove;

FIG. 40 is a view of an inside of an upper storage compartment according to an embodiment of the disclosure;

FIG. 41 is an exploded perspective view of a first cold air duct according to an embodiment of the disclosure;

FIG. 42 is a view of a state in which the first cold air duct is disposed at the refrigerator according to an embodiment of the disclosure;

FIG. 43 is a view of a state in which a straight guide member is disposed at the refrigerator according to an embodiment of the disclosure;

FIG. 44 is a view of a state in which the straight guide member of FIG. 43 is coupled to an insulating material inlet disposed in a machine compartment cover;

FIG. 45 is a view of a state in which a guide member according to an embodiment of FIG. 44 is coupled to the insulating material inlet disposed in the machine compartment cover;

FIG. 46 is a view of a state in which a Y-shaped guide member is disposed at the refrigerator according to an embodiment of the disclosure;

FIG. 47 is a view of a state in which the Y-shaped guide member of FIG. 46 is coupled to the insulating material inlet disposed in the machine compartment cover;

FIG. 48 is a view of a state in which a guide member according to an embodiment of FIG. 47 is coupled to the insulating material inlet disposed in the machine compartment cover; and

FIG. 49 is a view of a state in which a refrigerant pipe and a drainage pipe according to an embodiment of the disclosure are disposed at a side of the body.

DETAILED DESCRIPTION

Reference will now be made in detail to the embodiments of the disclosure, examples of which are illustrated in the accompanying drawings, wherein like reference numerals refer to like elements throughout.

Hereinafter, embodiments of the disclosure will be described in detail with reference to the attached drawings.

As illustrated in FIGS. 1 through 3, a refrigerator may include a body 10, a plurality of storage compartments 20 configured in the body 10 in such a way that a front side of

each of the plurality of storage compartments **20** is open, one or more doors **30** that is pivotally coupled to the body **10** so as to open/close the open front side of each of the storage compartments **20**, and a hinge unit **40** (see FIG. **10**) that causes the door **30** to be pivotally coupled to the body **10**.

The body **10** may include an inner case **11** that constitutes each storage compartment **20**, an outer case **13** that constitutes an exterior, and a cold air supplying unit that supplies cold air to the storage compartment **20**.

The cold air supplying unit may include a compressor **C**, a condenser (not shown), an expansion valve (not shown), one or more evaporators **E** (e.g. **E1**, **E2**), one or more blower fans **F** (e.g., **F1**, **F2**), and a cold air duct **D**. An insulating material **15** may be foamed between the inner case **11** and the outer case **13** of the body **10** so as to prevent outflow of the cold air of the storage compartment **20**.

The compressor **C**, the condenser (not shown), the expansion valve (not shown), and the evaporator **E** may be connected to one another using a refrigerant pipe **P**, and a refrigerant may be guided via the refrigerant pipe **P**.

A machine compartment **28** in which the compressor **C** and the condenser (not shown) in which the refrigerant is compressed and the compressed refrigerant is condensed, are installed, may be disposed at a lower side of the rear of the body **10**.

The evaporator **E** may include a first evaporator **E1** that supplies the cold air to an upper storage compartment **21** that will be described below and a second evaporator **E2** that supplies the cold air to a lower storage compartment **23**. The cold air generated by the first evaporator **E** may be supplied to the upper storage compartment **21** via a first blower fan **F1**, and the cold air generated by the second evaporator **E2** may be supplied to the lower storage compartment **23** via a second blower fan **F2**.

The cold air duct **D** may include a first cold air duct **700** that is disposed at a rear side of the upper storage compartment **21** and forms a first flow path **725** on which the cold air generated by the first evaporator **E1** is supplied to the upper storage compartment **21** via the first blower fan **F1**, and a second cold air duct **760** that is disposed at a rear side of the lower storage compartment **23** and forms a second flow path **763** on which the cold air generated by the second evaporator **E2** is supplied to the lower storage compartment **23** via the second blower fan **F2**.

A first cold air outlet **711** may be disposed at the first cold air duct **700** so that the cold air generated by the first evaporator **E1** may be supplied to the upper storage compartment **21** via the first cold air outlet **711**. A second cold air outlet **761** may be disposed at the second cold air duct **760** so that the cold air generated by the second evaporator **E2** may be supplied to the lower storage compartment **23** via the second cold air outlet **761**.

The storage compartment **20** may be partitioned by a partition **17** into a plurality of parts. The partition **17** may include a first partition **17a** that partitions off the storage compartment **20** into the upper storage compartment **21** and the lower storage compartment **23** and a second partition **17b** that partitions off the lower storage compartment **23** into a left storage compartment **25** and a right storage compartment **26**.

The upper storage compartment **21** of the upper storage compartment **21** and the lower storage compartment **23** that are partitioned off by the first partition **17a**, may be used as a refrigeration compartment, and the lower storage compartment **23** may be partitioned off by the second partition **17b** into the left storage compartment **25** and the right storage compartment **26** so that the left storage compartment **25** may

be used as a freezer compartment and the right storage compartment **26** may be used as both the freezer compartment and the refrigeration compartment.

Partitioning of the storage compartment **20** described above is merely one example. Each of the storage compartments **21**, **25**, and **26** may be used in a different manner from the above-described configuration. For example, there may only be one partition which divides the storage compartment **20** into upper and lower halves, or one partition which divides the storage compartment **20** into left and right halves, or there may be more than two partitions which divide the storage compartment **20** into more than three storage compartments.

A plurality of shelf units **600** may be disposed in the storage compartment **20** so that the storage compartment **20** may be partitioned off into a plurality of parts. A plurality of storage containers **27** in which food may be stored, may be disposed in the plurality of parts of the storage compartment **20**.

The open front side of the storage compartment **20** may be open/closed by the door **30** that is pivotally coupled to the body **10**, and a plurality of door guards **31** in which food may be accommodated, may be installed at a rear side of the door **30**.

The hinge unit **40** that causes the door **30** to be pivotally coupled to the body **10** may include an upper hinge **41** (see FIG. **10**) coupled to an upper portion of the body **10**, an intermediate hinge **43** coupled to the first partition **17a**, and a lower hinge (not shown) coupled to a lower portion of the body **10**.

As illustrated in FIGS. **1** through **3**, urethane may be mainly used as the insulating material **15** foamed between the inner case **11** and the outer case **13** of the body **10**, and foaming of the insulating material **15** may be performed only at a predetermined temperature or higher.

Since foaming of the insulating material **15** may be performed only at the predetermined temperature or higher, heat is generated while the insulating material **15** is foamed. Thus, in a state in which the insulating material **15** is foamed between the inner case **11** and the outer case **13**, the body **10** has a temperature approximately 20° C. higher than a room temperature.

After the insulating material **15** is foamed between the inner case **11** and the outer case **13**, the temperature of the body **10** may be lowered to the room temperature so that the insulating material **15** is solidified and the body **10** thermally contracts.

For example, where the inner case **11** is mainly formed of a plastic material, the outer case **13** is mainly formed of a steel material, and the plastic material has an approximately five times larger quantity of thermal contraction than that of the steel material, when the body **10** thermally contracts, the inner case **11** contracts more greatly than the outer case **13**. Thus, while the temperature of the body **10** is lowered to the room temperature, central parts of both sides of the body **10** are deformed in a convex shape toward an outside of the body **10**, and in a state in which the temperature of the body **10** is lowered to the room temperature, the insulating material **15** is solidified in a state in which the central parts of both sides of the body **10** are deformed in the convex shape toward the outside of the body **10**.

Also, in order to increase an internal capacity of the body **10** having the same exterior size, the thickness of the insulating material **15** foamed between the inner case **11** and the outer case **13** need to be reduced. In order to supplement lowered insulation performance caused by the reduced

thickness of the insulating material 15, a vacuum insulating material 19 may be disposed between the inner case 11 and the outer case 13.

The vacuum insulating material 19 may also be disposed in the insulating material 15 foamed between the inner case 11 and the outer case 13 of the body 10 and may also be disposed in the insulating material 15 foamed in the door 30, in the insulating material 15 foamed in the partition 17, or in the insulating material 15 foamed between a machine compartment cover 29 and the inner case 11.

When deformation occurs in the inner case 11 and the outer case 13 due to a difference in quantities of thermal contraction of the inner case 11 and the outer case 13, the deformation that occurs in the inner case 11 and the outer case 13 may be reduced by the insulating material 15 that contacts the inner case 11 and the outer case 13 to a predetermined degree. When the thickness of the insulating material 15 is reduced, a quantity of deformation in which the central parts of both sides of the body 10 are deformed in the convex shape toward the outside of the body 10, is increased by the reduced thickness of the insulating material 15. Even after the insulating material 15 is foamed, when the refrigerator operates, the temperature of the body 10 may be lowered such that the quantity of thermal contraction of the inner case 11 may be further increased and a quantity of deformation of the shape may be increased.

Thus, in order to prevent deformation of the shape that occurs due to the difference in the quantities of thermal contraction of the inner case 11 and the outer case 13 when the temperature of the body 10 is lowered to the room temperature after the insulating material 15 is foamed between the inner case 11 and the outer case 13, a reinforcement member 100 may be disposed at both sides of the body 10, as illustrated in FIGS. 4 and 5.

The reinforcement member 100 may be formed of a metal material (e.g., a steel material). The reinforcement member 100 may be disposed in the insulating material 15 between the inner case 11 and the outer case 13 on one or at both sides of the body 10 and may prevent deformation of the shape that occurs due to the difference in the quantities of thermal contraction of the inner case 11 and the outer case 13 due to rigidity of the reinforcement member 100.

For example, the reinforcement member 100 may be disposed at both sides of the body 10 in a widthwise direction or a lengthwise direction according to a direction in which the insulating material 15 foamed between the inner case 11 and the outer case 13 flows.

When the insulating material 15 is foamed between the inner case 11 and the outer case 13 and flows in a direction from a rear side of the body 10 to a front side of the body 10, the reinforcement member 100 may be disposed at both sides of the body 10 in the widthwise direction.

When the reinforcement member 100 is disposed at both sides of the body 10 in the widthwise direction, the reinforcement member 100 may include a first reinforcement member 110 disposed at an upper portion of the first partition 17a based on the first partition 17a that partitions off the storage compartment 20 into the upper storage compartment 21 and the lower storage compartment 23 and a second reinforcement member 120 disposed at a lower portion of the first partition 17a, for example, as shown in FIG. 4. The first reinforcement member 110 and the second reinforcement member 120 may be positioned at a distance from the edge of the front side of the body 10 and at a distance from the edge of the rear side of the body 10. For example, the first reinforcement member 110 and the second reinforcement member 120 may be positioned centrally in

the widthwise direction (i.e., in a direction to/from the rear side of the body 10 from/to the front side of the body 10).

The first reinforcement member 110 and the second reinforcement member 120 may be attached to the inner case 11 between the inner case 11 and the outer case 13, as illustrated in FIG. 4 and may be attached to the outer case 13, as illustrated in FIG. 6.

If the first reinforcement member 110 and the second reinforcement member 120 are disposed only in the insulating material 15 between the inner case 11 and the outer case 13, it does not matter that the first reinforcement member 110 and the second reinforcement member 120 are attached to any one of the inner case 11 and the outer case 13.

The first reinforcement member 110 disposed at the upper portion of the body 10 has a smaller length than a length of both sides of the body 10 in a forward/backward direction and may be disposed to have a thickness T1 of about 0.5 mm.

The first reinforcement member 110 may have a maximum height H1 between the inner case 11 and the outer case 13 so as to increase a cross-sectional coefficient in a direction in which shapes of the inner case 11 and the outer case 13 are deformed.

The first reinforcement member 110 may be disposed in a shape of an unevenness having a maximum height H without disturbing a flow of the insulating material 15 foamed between the inner case 11 and the outer case 13.

The first reinforcement member 110 may be attached to the inner case 11 or the outer case 13 using an adhesion unit, such as a double-sided tape. Alternatively, or additionally, other adhesive type materials may be used to attach the first reinforcement member 110 to the inner case 11 or the outer case 13 (e.g., glue, paste, etc.), and/or the first reinforcement member 110 may be attached to the inner case 11 or the outer case 13 using a fastening member (e.g., a screw, a bolt, a pin, a rivet, an anchor, an adhesive, and the like). Although not shown, the first reinforcement member 110 may include a fixing unit that may fix the first reinforcement member 110 to the inner case 11 or the outer case 13 so as to prevent the first reinforcement member 110 attached to the inner case 11 or the outer case 13 from being moved when the insulating material 15 is foamed.

Like the first reinforcement member 110, the second reinforcement member 120 disposed at the lower portion of the body 10 may have a smaller length than a length of both sides of the body 10 in the forward/backward direction and may be disposed to have a thickness T2 of about 0.5 mm. The second reinforcement member 120 may have a maximum height H2 between the inner case 11 and the outer case 13 so as to increase a cross-sectional coefficient in a direction in which shapes of the inner case 11 and the outer case 13 are deformed.

Like the first reinforcement member 110, although not shown, the second reinforcement member 120 may include a fixing unit that may fix the second reinforcement member 120 to the inner case 11 or the outer case 13 so as to prevent the second reinforcement member 120 attached to the inner case 11 or the outer case 13 from being moved when the insulating material 15 is foamed.

As illustrated in FIG. 7, when the insulating material 15 is foamed between the inner case 11 and the outer case 13 and flows in a direction from the upper portion of the body 10 to the lower portion of the body 10, a reinforcement member 130 may be disposed at both sides of the body 10 in the lengthwise direction.

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When the reinforcement member **130** is disposed at both sides of the body **10** in the lengthwise direction, the reinforcement member **130** has a smaller length than a length of both sides of the body **10** in a vertical direction and may be disposed to have a thickness of about 0.5 mm.

The reinforcement member **130** disposed at both sides of the body **10** in the lengthwise direction may have the same shape as that of the first reinforcement member **110** and may be disposed in a shape in which only the length of the reinforcement member **130** is larger than that of the first reinforcement member **110**.

Also, like the first reinforcement member **110** and the second reinforcement member **120**, the reinforcement member **130** may be attached to the inner case **11** between the inner case **11** and the outer case **13**, as illustrated in FIG. 7, and although not shown in the drawings, the reinforcement member **130** may also be attached to the outer case **13**.

As described above, the reinforcement members **100** and **130** are disposed between the inner case **11** and the outer case **13** at both sides of the body **10** so that rigidity of the body **10** is reinforced and a quantity of deformation of the body **10** caused by the difference in the quantities of thermal contraction between the inner case **11** and the outer case **13** may be reduced. Although example embodiments have been provided in which one or two reinforcement members are disposed on a side of the body **10**, the disclosure is not so limited. For example, more than two reinforcement members may be disposed on a side of the body **10**, and the number of reinforcement members may be determined according to a size of the side of the body **10**, for example. Also, the reinforcement members may be arranged or oriented at other angles than a horizontal or vertical orientation (e.g., diagonally).

As illustrated in FIGS. 1 through 3, the thickness of the insulating material **15** foamed between the inner case **11** and the outer case **13** needs to be reduced so as to increase the internal capacity of the body **10** having the same exterior size. When the thickness of the insulating material **15** is reduced, insulation performance may be lowered, and rigidity is deteriorated such that deformation may occur in the body **10** due to the weight of the body **10** and a load of a material stored in the body **10**.

In order to improve the insulation performance that is lowered due to the reduced thickness of the insulating material, a vacuum insulation panel (VIP) **19** may be disposed between the inner case **11** and the outer case **13** together with the insulating material **15**.

The VIP **19** may have approximately eight times larger insulation performance than that of the insulating material **15**, and an inside of the VIP **19** may be vacuum treated so as to maximize the insulation performance.

The VIP **19** may be disposed between the inner case **11** and the outer case **13** together with the insulating material **15** and may supplement the lowered insulation performance but may not supplement deteriorated rigidity.

As illustrated in FIGS. 8 and 9, a reinforcement frame **200** may be disposed at the front side of the body **10** so as to supplement the deteriorated rigidity of the body **10**. Reinforcement frame **200** may be provided in addition to, or instead of, reinforcement members **100** and/or **130**. Thus, it may be understood by one of ordinary skill in the art that the reinforcement frame **200** shown in FIGS. 8 and 9 may be included in a refrigerator together with reinforcement members **100** and/or **130** as shown in FIGS. 3 through 7, for example.

The reinforcement frame **200** may be disposed at a front side of the inner case **11** and may supplement rigidity of the

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body **10**. The reinforcement frame **200** may include one or more of an upper reinforcement frame **210** coupled to an upper portion of the front side of the inner case **11**, an intermediate reinforcement frame **220** coupled to a central portion of the front side of the inner case **11** to which the first partition **17a** is coupled, a lower reinforcement frame **230** coupled to a lower portion of the front side of the inner case **11**, and a first side reinforcement frame **240** and a second side reinforcement frame **250** coupled to both sides of the front side of the inner case **11**.

The first side reinforcement frame **240** may be disposed at an upper portion of both sides of the front side of the inner case **11**, and a part of a top end of the first side reinforcement frame **240** may be disposed to overlap the upper reinforcement frame **210**, and a bottom end of the first side reinforcement frame **240** may be disposed to extend from the top end of the first side reinforcement frame **240** to a space between the intermediate reinforcement frame **220** and the lower reinforcement frame **230**.

The second side reinforcement frame **250** may be disposed at a lower portion of both sides of the front side of the inner case **11**, and a bottom end of the second side reinforcement frame **250** may be coupled to the lower reinforcement frame **230**, and a top end of the second side reinforcement frame **250** may be disposed to extend from the bottom end of the second side reinforcement frame **250** to a position at which the top end of the second side reinforcement frame **250** is spaced a predetermined distance apart from the bottom end of the first side reinforcement frame **240**. The intermediate reinforcement frame **220** may extend from one side of the front side of the inner case **11** to the other side of the front side of the inner case **11** (e.g., in the horizontal direction at a position corresponding to the first partition **17a**). The intermediate reinforcement frame **220** may overlap with and/or be coupled to a part of the first side reinforcement frame **240** (e.g., a middle part) on both sides of the front side of the inner case **11**. The lower reinforcement frame **230** may extend from one side of the front side of the inner case **11** to the other side of the front side of the inner case **11** (e.g., in the horizontal direction at a position corresponding to a bottom of the body **10**). The lower reinforcement frame **230** may overlap with and/or be coupled to a part of the second side reinforcement frame **250** (e.g., a bottom part) on both sides of the front side of the inner case **11**.

As illustrated in FIGS. 1 through 3, an electric apparatus box **300** in which electric apparatus components for controlling an operation of the refrigerator are accommodated, may be disposed in the front of the upper portion of the body **10**.

As illustrated in FIGS. 10 through 14, the electric apparatus box **300** may include a base **310** installed to cover an electric apparatus box installation hole **13a** disposed in the front of the upper portion of the body **10**, a cover **320** that covers an upper portion of the base **310** so that an accommodation space **S** may be formed in the upper portion of the base **310**, a printed circuit board (PCB) **330** which is disposed in the accommodation space **S** and on which electronic components **331** are mounted, a PCB mounting portion **340** on which the PCB **330** is mounted, and a reinforcement plate **350** disposed between the PCB mounting portion **340** and the cover **320**.

The base **310** may include a base portion **311** coupled to the front of the upper portion of the body **10** and an accommodation groove **317** accommodated in the electric

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apparatus box installation hole **13a** when the base portion **311** is coupled to the front of the upper portion of the body **10**.

The base portion **311** forms edges of the accommodation groove **317** which may have a rectangular shape, and a plurality of fixing hooks **313** may be disposed at a front edge and a rear edge of the accommodation groove **317**, and a wire through hole **315** through which wires **333** connected to the PCB **330** may be connected to the inside of the body **10**, is disposed in the rear of both sides of the base portion **311**.

Each of the plurality of fixing hooks **313** may include a plurality of first fixing hooks **313a** disposed at the front edge of the accommodation groove **317** and a plurality of second fixing hooks **313b** disposed at the rear edge of the accommodation groove **317**.

The plurality of first fixing hooks **313a** may be inserted into and fixed to the upper reinforcement frame **210** coupled to the upper portion of the front side of the inner case **11**, and the plurality of second fixing hooks **313b** may be inserted into and fixed to a rear edge of the electric apparatus box installation hole **13a**.

Since the first fixing hooks **313a** and the second fixing hooks **313b** disposed at the base portion **311** may be fixed to the upper reinforcement frame **210** and the rear edge of the electric apparatus box installation hole **13a**, respectively, the base **310** serves as an outer case when the base **310** is coupled to the front of the upper portion of the body **10**, and the base **310** may be maintained in a fixed state without being moved, due to a foaming pressure when the insulating material **15** is foamed between the inner case **11** and the outer case **13**.

Since the accommodation groove **317** may be accommodated in the electric apparatus box installation hole **13a** disposed in the front side of the upper portion of the body **10**, the accommodation groove **317** may have a shape in which it is recessed from the upper portion of the body **10** based on the upper portion of the body **10**.

Since the accommodation groove **317** may be disposed in the shape in which it is recessed from the upper portion of the body **10**, a height of the accommodation space **S** disposed between the base **310** and the cover **320** may be increased, and a height of the electric apparatus box **300** disposed at the front side of the upper portion of the body **10** may be visually decreased.

The cover **320** may be coupled to the upper portion of the base **310** so that the accommodation space **S** may be formed between the base **310** and the cover **320**. The cover **320** may include a hinge cover portion **321** that covers an upper portion of the upper hinge **41** coupled to the upper portion of the body **10** so that the door **30** may be rotatably coupled to the body **10**.

A plurality of PCBs **330** may be disposed and may be accommodated in the accommodation space **S** formed between the base **310** and the cover **320**, and a plurality of electronic components **331** may be mounted on a lower surface of each of the plurality of PCBs **330**.

An upper surface of each of the plurality of PCBs **330** on which no electronic components **331** are mounted, may be mounted on the PCB mounting portion **340**, and the PCB mounting portion **340** may be coupled to the cover **320**.

Since the PCB mounting portion **340** on which the plurality of PCBs **330** are mounted, is coupled to the cover **320**, the plurality of PCBs **330** may be placed in the accommodation space **S** at a position that is the farthest from the upper storage compartment **21**.

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Since the plurality of PCBs **330** are placed in the accommodation space **S** at the position that is the farthest from the upper storage compartment **21**, heat generated in the electronic components **331** mounted on the plurality of PCBs **330** may be prevented from being transferred to an inside of the upper storage compartment **21** as much as possible.

A connector coupling portion **341** may be disposed at both sides of the PCB mounting portion **340**, and a wire connector **335** to which the wires **333** connected to the PCBs **330** are fixed, may be coupled to the connector coupling portion **341**.

Thus, the wires **333** connected to the PCBs **330** may be agglomerated and are fixed using the wire connector **335** coupled to the connector coupling portion **341**, and the wires **333** agglomerated by the wire connector **335** may be connected to the inside of the body **10** through the wire through hole **315** formed in the base **310**.

Thus, the wires **333** connected to the PCBs **330** pass through the wire through hole **315** formed in the base **310** through both sides of the PCB mounting portion **340**. The wires **333** that pass through the wire through hole **315** may be connected to the inside of the body **10** via a hinge hole **41a** of the upper hinge **41**. That is, for example as shown in FIG. 1 where two doors are provided, wires **333** may pass through a wire through hole **315** which is disposed at opposite sides of the base **310** at positions corresponding to a hinge hole **41a** of an upper hinge **41** disposed at an upper part of each of the doors.

The reinforcement plate **350** which may be formed of a steel material, may be disposed between the PCB mounting portion **340** on which the plurality of PCBs **330** are mounted, and the cover **320**.

The reinforcement plate **350** reduces shock transferred to the plurality of PCBs **330** accommodated in the accommodation space **S** when the shock is applied to an upper portion of the electric apparatus box **300**, thereby protecting the electronic components **331**.

Also, when or if a fire breaks out in the electronic components **331** mounted on the plurality of PCBs **330**, the reinforcement plate **350** may prevent the fire from being spread toward an outside of the electric apparatus box **300** so that the risk of a fire accident or fire damage may be reduced.

As illustrated in FIGS. 15 through 19, a heating pipe **400** for preventing dew condensation that occurs in the outer case **13** may be disposed at the front edge of the inner case **11** of the body **10**.

When the refrigerator operates, cold air in the storage compartment **20** flows into the outer case **13** that constitutes the exterior of the body **10** so that dew condensation may occur in the outer surface of the outer case **13** due to a difference in temperatures of an inside and an outside of the outer case **13**.

In order to prevent dew condensation that occurs in the outer surface of the outer case **13**, the heating pipe **400** through which a high-temperature refrigerant flows, is fixed to the front edge of the inner case **11**.

A plurality of mounting portions **410** on which the heating pipe **400** is mounted, may be disposed at the front edge of the inner case **11**.

The plurality of mounting portions **410** disposed at the front edge of the inner case **11** may be disposed most adjacent to the outer case **13** when the inner case **11** and the outer case **13** are coupled to each other.

Since the mounting portions **410** are disposed most adjacent to the outer case **13**, the heating pipe **400** mounted on the mounting portions **410** may be disposed at a position at

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which the heating pipe 400 is spaced apart from the inside of the storage compartment 20 as much as possible and may be disposed most adjacent to the outer case 13.

Since the heating pipe 400 is disposed at the position at which it is spaced apart from the inside of the storage compartment 20 as much as possible, the possibility that high-temperature heat generated by the high-temperature refrigerant that flows through an inside of the heating pipe 400 will be transferred to the inside of the storage compartment 20, may be reduced.

When the high-temperature heat is transferred to the inside of the storage compartment 20, due to the high-temperature heat, the temperature of the inside of the storage compartment 20 rises and thus, energy is consumed so as to lower the temperature of the inside of the storage compartment 20.

Since the possibility that the high-temperature heat will be transferred to the inside of the storage compartment 20 is reduced by spacing the heating pipe 400 apart from the inside of the storage compartment 20 as much as possible, a rising width (increase) of the temperature of the inside of the storage compartment 20 may be reduced so that consumption of energy for lowering the temperature of the inside of the storage compartment 20 may be reduced.

Also, since the heating pipe 400 is disposed most adjacent to the outer case 13, even when the high-temperature heat generated by the high-temperature refrigerant that flows through the inside of the heating pipe 400 is well transferred to the outer case 13 and the cold air in the storage compartment 20 flows into the outer case 13, the temperature difference between the outside and the inside of the outer case 13 is reduced so that dew condensation that occurs in the outer surface of the outer case 13 may be prevented.

The heating pipe 400 mounted on the mounting portions 410 may be fixed to the mounting portions 410 using a plurality of clips 430. A fixing groove 420 to which the plurality of clips 430 may be fixed, may be disposed in a part of the plurality of mounting portions 410.

The fixing groove 420 may include a first fixing groove 421 and a second fixing groove 423 to which both ends of the clips 430 are inserted and fixed. The clips 430 may include a first fixing portion 431 inserted into and fixed to the first fixing groove 421 and a second fixing portion 433 inserted into and fixed to the second fixing groove 423. As can be seen from FIG. 19, a first end of the clip 430 (first fixing portion 431) is bent such that it is fixed to the first fixing groove 421. The clip 430 extends from the first end around at least a portion of the heating pipe 400, at the second end of the clip 430 (second fixing portion 433) is bent such that it is fixed to the second fixing groove 423.

The clips 430 may be fixed to the fixing groove 420 so that the heating pipe 400 may be accommodated in the clips 430, and the heating pipe 400 may be fixed to the mounting portions 410.

Since the heating pipe 400 may be fixed to the mounting portions 410 using the clips 430 in a state in which the heating pipe 400 is mounted on the mounting portions 410, the heating pipe 400 may be easily fixed to the front edge of the inner case 11.

As illustrated in FIGS. 18 and 19, the first fixing groove 421 may be indented from an outer surface of the inner case 11, and the second fixing groove 423 may also be indented from the outer surface of the inner case. The first fixing portion 431 may be insertedly fixed to the first fixing groove 421 and the second fixing portion 433 may be insertedly fixed to the second fixing groove 423. The heating pipe 400 may be disposed in the second fixing groove 423 and a

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portion of the clip 430 may surround a portion of the heating pipe 400 to secure the heating pipe 400 in the second fixing groove 433.

As illustrated in FIGS. 1 and 2, a storage unit 500 may be disposed in the storage compartment 20 and may slide in the forward/backward direction.

The storage unit 500 may be disposed in the left storage compartment 25 or the right storage compartment 26 of the lower storage compartment 23, and merely for convenience or explanation, the storage unit 500 disposed in the right storage compartment 26 will now be described.

As illustrated in FIGS. 20 through 27 and 31, the storage unit 500 may include a first storage box 510 that is supported at both sidewalls of the right storage compartment 26 and slides in the forward/backward direction, a second storage box 520 that is disposed in the first storage box 510 and slides in the forward/backward direction, and a sliding shelf 530 that causes the first storage box 510 to be inserted into the right storage compartment 26 and to be taken out from the right storage compartment 26 in a sliding manner.

The sliding shelf 530 may be coupled to a lower portion of the first storage box 510 so that the first storage box 510 may be inserted into and taken out from the right storage compartment 26.

A coupling portion 26a for coupling a cover rail 550 may be disposed at both sidewalls of the right storage compartment 26. The coupling portion 26a may be integrally disposed at both sidewalls of the right storage compartment 26.

The coupling portion 26a may be disposed in such a way that the cover rail 550 may be inserted into the coupling portion 26a in the sliding manner.

A procedure in which the sliding shelf 530 is installed, will now be described. First, the cover rail 550 of the sliding shelf 530 may be pushed to the coupling portion 26a in the sliding manner, and a fastening member B may be inserted into a fastening hole 551 formed in the cover rail 550 so that the cover rail 550 may be coupled to the coupling portion 26a. For example, the fastening member B may include a screw, a bolt, a pin, a rivet, an anchor, an adhesive, and the like.

When the cover rail 550 is coupled to the coupling portion 26a, a slide unit 540 may be taken out from an outside of the right storage compartment 26 and then, the first storage box 510 may be coupled to the slide unit 540 so that a coupling protrusion 541a disposed on the slide unit 540 may be inserted into a coupling groove 511 of the first storage box 510.

When the first storage box 510 is coupled to the slide unit 540, the slide unit 540 may be guided along the cover rail 550 in the sliding manner so that the first storage box 510 may be inserted into and taken out from the inside of the right storage compartment 26.

Since the sliding shelf 530 is coupled to a lower portion of the first storage box 510, the first storage box 510 may be fully taken out toward the outside of the right storage compartment 26 so that food stored in the first storage box 510 may be easily taken out and used or placed therein.

Also, since the sliding shelf 530 has a structure in which it is coupled to the lower portion of the first storage box 510, food may be directly kept in an upper portion of the sliding shelf 530 without coupling the first storage box 510 to the upper portion of the sliding shelf 530, and food may also be kept in the first storage box 510 by coupling the first storage box 510 to the upper portion of the sliding shelf 530.

Next, a configuration of the sliding shelf 530 will be described in detail.

As illustrated in FIGS. 20 through 27, the sliding shelf 530 may include the cover rail 550 coupled to both sidewalls of the right storage compartment 26, the slide unit 540 that slides along the cover rail 550, and a self closing unit 560 that is coupled to the slide unit 540 and transfers an elastic force in a direction in which the first storage box 510 is inserted into the right storage compartment 26, so that the first storage box 510 may be easily closed with a small force.

The slide unit 540 may include a sliding portion 541 coupled to the lower portion of the first storage box 510 and a slide rail 543 that is disposed at both sides of the sliding portion 541 and slides along the cover rail 550.

The coupling protrusion 541a may be disposed at an upper portion of both sides of a front side of the sliding portion 541 and may protrude in an upward direction so that the first storage box 510 and the sliding portion 541 may be coupled to each other. The coupling groove 511 in which the coupling protrusion 541a is inserted, may be disposed at a position corresponding to the coupling protrusion 541a in the first storage box 510.

The cover rail 550 may be coupled to and fixed to the coupling portion 26a, as described above, and may guide the first storage box 510 to be inserted into and taken out from the right storage compartment 26 in the sliding manner.

As illustrated in FIGS. 26 through 30, the self closing unit 560 may include a case 570 that is disposed at both sides of the lower portion of the sliding portion 541 and constitutes an exterior, an elastic unit 580 that is disposed in the case 570 and accumulates an elastic force when the first storage box 510 is taken out and that transfers the elastic force in a direction in which the first storage box 510 is inserted, when the first storage box 510 is inserted, and an oil damper 590 that is coupled to the elastic unit 580 and absorbs the shock that occurs when the first storage box 510 is inserted.

The elastic unit 580 may include a slider 581 that makes a straight motion in the case 570, a rotator 583 that is rotatably coupled to the slider 581, and an elastic member 585 having both ends connected to the slider 581 and the case 570.

The slider 581 may include a rotation hole 581a through which a rotation shaft 583b disposed on the rotator 583 that will be described below is rotatably coupled, a first fixing groove 581b to which the elastic member 585 is fixed, and a second fixing groove 581c to which the oil damper 590 is fixed.

The slider 581 makes a straight motion along a guide rail 571 that will be described below, together with the rotator 583. The elastic member 585 fixed to the first fixing groove 581b of the slider 581 is tensile through the straight motion so that the elastic member 585 may accumulate an elastic force.

The rotator 583 may include a protrusion portion 583a that protrudes from a lower portion of the rotator 583 in a downward direction so that the rotator 583 may be guided along the guide rail 571, a rotation shaft 583b that causes the rotator 583 to be rotatably coupled to the slider 581, and a hanging groove 583c in which a hanging member 553 disposed on the cover rail 550 is accommodated and is hung.

The protrusion portion 583a may be disposed to protrude from the lower portion of the rotator 583 toward the guide rail 571 and may be moved along the guide rail 571 so that the rotator 583 may be guided along the guide rail 571.

The rotation shaft 583b may be disposed on the upper portion of the rotator 583 and may be rotatably coupled to the rotation hole 581a of the slider 581.

The rotator 583 may be disposed to rotate around the rotation shaft 583b due to the rotation shaft 583b and makes a straight motion in a predetermined section together with the slider 581 and rotates.

The hanging groove 583c may be disposed in such a way that the hanging member 553 disposed on the cover rail 550 may be hung in the hanging groove 583c and when the first storage box 510 is inserted into and taken out from the right storage compartment 26, the rotator 583 that is moved together with the first storage box 510 may be moved along the guide rail 571.

Since the hanging member 553 disposed on the cover rail 550 fixed to the coupling portion 26a of the right storage compartment 26 may be maintained in a fixed state, when the first storage box 510 is inserted into and taken out from the right storage compartment 26, if the hanging member 553 is hung in the hanging groove 583c of the rotator 583, the rotator 583 is moved along the guide rail 571.

The elastic member 585 may be disposed as a spring, and both ends of the elastic member 585 may be fixed to the case 570 and the slider 581, respectively.

A portion of both ends of the elastic member 585 fixed to the case 570 may be maintained in the fixed state, and a portion of both ends of the elastic member 585 fixed to the slider 581 may be moved together with the slider 581 when the slider 581 makes a straight motion, is tensile, is returned to its original state, and transfers the elastic force to the first storage box 510.

The case 570 may be disposed at the lower portion of the sliding portion 541 and constitutes an exterior. The elastic unit 580 and the oil damper 590 may be accommodated in the case 570.

The guide rail 571 in which the protrusion portion 583a of the rotator 583 is accommodated and is moved, a guide portion 573 that is a path on which the hanging member 553 moved together with the rotator 583 is moved, a fixing portion 575 to which the elastic member 585 is fixed, a first accommodation portion 577 in which the elastic member 585 is accommodated, and a second accommodation portion 579 in which the oil damper 590 is accommodated, may be disposed in the case 570.

The guide rail 571 may be disposed in such a way that the protrusion portion 583a disposed on the rotator 583 may be accommodated and moved, and the rotator 583 and the slider 581 may be guided on the guide rail 571, as described above.

The guide rail 571 may include a straight path 571a on which the rotator 583 is guided to make a straight motion in the forward/backward direction, and a hanging portion 571b disposed on one end of the straight path 571a so that the rotator 583 may rotate and may be fixed.

The guide portion 573 may be disposed to be parallel to the straight path 571a of the guide rail 571 and may guide the hanging member 553 that is hung in the hanging groove 583c of the rotator 583 and may be moved together with the rotator 583, to make a straight motion.

The oil damper 590 may include a body portion 591 that is filled with oil and is accommodated in the second accommodation portion 579 of the case 570, and a movement portion 593 that is accommodated in the body portion 591 and has one end fixed to the second fixing groove 581c of the slider 581.

Since one end of the movement portion 593 may be fixed to the slider 581, the movement portion 593 may be moved together with the slider 581.

Since, when the first storage box 510 is inserted into and taken out from the right storage compartment 26, the slider 581 may also be moved together with the first storage box

510 in the same direction as that of the first storage box 510, when the first storage box 510 is inserted into the right storage compartment 26, the movement portion 593 is inserted into the body portion 591, and when the first storage box 510 is taken out from the right storage compartment 26, the movement portion 593 is also taken out from an inside of the body portion 591 outwards.

Since, when the movement portion 593 is taken out from and is inserted into the inside of the body portion 591, the movement portion 593 absorbs shock through the oil filled in the body portion 591, a rapid movement of the elastic unit 580 that occurs when the first storage box 510 is inserted into the right storage compartment 26, may be prevented due to the elastic force of the elastic unit 580.

Thus, the shock that occurs when the first storage box 510 is rapidly inserted into the right storage compartment 26, is absorbed due to the elastic force of the elastic unit 580 so that noise may be reduced.

The body portion 591 may be maintained in a state in which it is accommodated in the second accommodation portion 579 of the case 570, and only the movement portion 593 is moved together with the slider 581, and a hanging jaw 579a may be disposed on the second accommodation portion 579 so that the movement portion 593 may be taken out from and inserted into the inside of the body portion 591 through the hanging jaw 579a.

The hanging jaw 579a may be disposed in such a way that a space which the body portion 591 does not pass through and only the movement portion 593 may pass through is formed, and when the movement portion 593 is moved together with the slider 581, the body portion 591 may be hung in the hanging jaw 579a so that movement may be prevented.

The first storage box 510 may be inserted into and taken out from the right storage compartment 26 in a sliding manner by using the sliding shelf 530.

As illustrated in FIGS. 31 through 34, the first storage box 510 may include a coupling groove 511 into which the coupling protrusion 541a of the sliding shelf 530 is inserted and is coupled, a guide rail 513 on which the second storage box 520 is guided to slide in the forward/backward direction, and a first storage box handle 515 (see FIG. 25) through which the first storage box 510 is grasped by a user and may be inserted into and taken out from the right storage compartment 26.

The guide rail 513 may be disposed at both sides of an inside of the first storage box 510, and the second storage box 520 may be guided on the guide rail 513 so as to slide in the forward/backward direction.

The guide rail 513 may be disposed to have a shape in which it is recessed from both sides of the inside of the first storage box 510 toward an outside of the first storage box 510.

The second storage box 520 may be accommodated in the first storage box 510 and slides in the forward/backward direction. The second storage box 520 may include a roller 521 that causes the second storage box 520 to be guided along the guide rail 513 disposed in the first storage box 510 and to slide in the forward/backward direction in the first storage box 510, and a second storage box handle 523 through which the second storage box 520 may be grasped by the user and may be moved in the forward/backward direction in the first storage box 510.

The roller 521 may be disposed at a lower portion of both sides of an outside of the second storage box 520 and may be guided along the guide rail 513 disposed in the first storage box 510, and an escape prevention jaw 513a may be

disposed on an upper portion of the guide rail 513 so that escape of the roller 521 may be prevented.

Since the second storage box 520 may be accommodated in the first storage box 510 and slides in the forward/backward direction, the guide rail 513 disposed at both sides of the inside of the first storage box 510 may be disposed at a position at which the guide rail 513 is spaced apart from an upper edge surface of the first storage box 510 in the downward direction by a distance at which an upper edge surface of the second storage box 520 and the roller 521 are spaced apart from each other. For example, the upper edge surface of the second storage box 520 may be substantially even with the upper edge surface of the first storage box 510 when the second storage box 520 is inserted or disposed on the guide rail 513 disposed in the first storage box 510.

When the first storage box 510 is inserted into and taken out from the right storage compartment 26, the second storage box 520 may be inserted into and taken out from the right storage compartment 26 together with the first storage box 510. Since the second storage box 520 is disposed to slide in the forward/backward direction in the first storage box 510, an internal space of the first storage box 510 may be efficiently used.

As illustrated in FIGS. 1 and 2, the plurality of shelf units 600 may be disposed in the upper storage compartment 21 so that the upper storage compartment 21 may be partitioned off into a plurality of parts.

As illustrated in FIGS. 35 through 39, the plurality of shelf units 600 may include a shelf 610 including a first shelf 611 and a second shelf 613, a bracket 620 that is coupled to both sides of the first shelf 611 and both sides of the second shelf 613 and supports the first shelf 611 and the second shelf 613, and a leveling portion 630 that is disposed at the bracket 620 and levels the first shelf 611 and the second shelf 613.

The shelf 610 may include the first shelf 611 disposed at the left side of the upper storage compartment 21 and the second shelf 613 disposed at the right side of the upper storage compartment 21, for example. However, this is only one example, and only one shelf may be disposed in a horizontal direction in the refrigerator or more than two shelves may be disposed adjacent to one another in a horizontal direction in the refrigerator. The first shelf 611 and the second shelf 613 may be leveled with respect to each other and partition off the upper storage compartment 21.

A first protrusion portion 611a may be disposed at a front end of a right surface of the first shelf 611, and a second protrusion portion 613a may be disposed at a front end of a left surface of the second shelf 613 so as to be spaced apart from the first protrusion portion 611a by a predetermined distance.

The first protrusion portion 611a and the second protrusion portion 613a may be maintained to be spaced apart from each other by a predetermined distance. When the first shelf 611 is twisted in a right direction or the second shelf 613 is twisted in a left direction, the first protrusion portion 611a and the second protrusion portion 613a contact each other.

When the first shelf 611 is twisted in the right direction, the first protrusion portion 611a contacts the second protrusion portion 613a so that the first shelf 611 is not twisted in the right direction any more. When the second shelf 613 is twisted in the left direction, the second protrusion portion 613a contacts the first protrusion portion 611a so that the second shelf 613 is not twisted in the left direction any more and the first shelf 611 and the second shelf 613 may be prevented from being twisted in a horizontal direction.

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The bracket **620** may include a first bracket **621** that is coupled to the left surface of the first shelf **611** and supports the first shelf **611**, a second bracket **623** that is coupled to the right surface of the first shelf **611** and supports the first shelf **611**, a third bracket **625** that is coupled to the left surface of the second shelf **613** and supports the second shelf **613**, and a fourth bracket (not shown) that is coupled to the right surface of the second shelf **613** and supports the second shelf **613**.

The bracket **620** may be supported by a support portion **640** disposed between the first cold air duct **700** and the inner case **11** through a shelf unit fixing hole **713** formed in the first cold air duct **700**.

Food or other objects may be stacked on upper portions of the first shelf **611** and the second shelf **613** and may be stored therein. Types of food stored in the upper portion of the first shelf **611** and the upper portion of the second shelf **613** may be different from each other, and therefore each shelf may be subject to a different load being applied thereto.

For example, if the type of food stored in the upper portion of the first shelf **611** and the type of food stored in the upper portion of the second shelf **613** are different from each other, weights of the food may be different from each other. Thus, the first shelf **611** and the second shelf **613** may not be leveled, and one shelf **610** may sag in the downward direction.

As described above, the leveling portion **630** may be disposed at the bracket **620** that supports the shelf **610** so that one shelf **610** of the first shelf **611** and the second shelf **613** may not sag in the downward direction and may be leveled.

The leveling portion **630** may include a first fixing portion **631** coupled to the second bracket **623** that supports the right surface of the first shelf **611**, and a second fixing portion **633** coupled to the third bracket **625** that supports the left surface of the second shelf **613**.

The first fixing portion **631** and the second fixing portion **633** may be coupled to the second bracket **623** and the third bracket **625** by using a fastening member **B**, and a fixing protrusion **631a** may be disposed at the first fixing portion **631**, and a fixing groove **633a** may be disposed in the second fixing portion **633**. As noted above, the fastening member **B** may include a screw, a bolt, a pin, a rivet, an anchor, an adhesive, and the like.

The first fixing portion **631** may be disposed at the right surface of the second bracket **623**, and the second fixing portion **633** may be disposed at the left surface of the third bracket **625**, and the fixing protrusion **631a** and the fixing groove **633a** may be disposed to correspond to each other when the first shelf **611** and the second shelf **613** are leveled.

Since the fixing protrusion **631a** and the fixing groove **633a** may be disposed to correspond to each other and the fixing protrusion **631a** is disposed to be inserted into the fixing groove **633a** and fixed thereto, when the fixing protrusion **631a** is inserted into and fixed to the fixing groove **633a**, the first shelf **611** and the second shelf **613** are leveled.

Also, since the fixing protrusion **631a** may be inserted into and fixed to the fixing groove **633a**, even though the first shelf **611** and the second shelf **613** may be in a state in which different types of food are stored (i.e., different loads are applied thereto), and/or may be used for a long time, one of the first shelf **611** and the second shelf **613** may be prevented from sagging in the downward direction and thus, the first shelf **611** and the second shelf **613** may be leveled.

As illustrated in FIGS. 2 and 3 and 40 through 42, the first evaporator **E1** and the first blower fan **F1** that supply the

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cold air to the upper storage compartment **21** may be disposed between the first cold air duct **700** and the inner case **11**.

The first cold air duct **700** may include a front plate **710** in which a plurality of first cold air outlets **711** are disposed, a cold air flow path portion **720** that is disposed at a rear side of the front plate **710** and constitutes the first flow path **725** on which the cold air is moved, and a first blower fan mounting portion **730** disposed at a lower portion of the cold air flow path portion **720**.

The front plate **710** may be formed of a metal material (e.g., an aluminum material) so that the front plate **710** may be uniformly cooled by the cold air in the upper storage compartment **21** through thermal conduction and the inside of the upper storage compartment **21** may be maintained at a uniform temperature.

The plurality of first cold air outlets **711** through which the cold air guided through the first flow path **725** is discharged into the upper storage compartment **21**, and the shelf unit fixing hole **713** for fixing the shelf unit **600** may be disposed on the front plate **710**.

A lower portion of the front plate **710** may be disposed in a streamline form that is bent in a direction of the upper storage compartment **21** as the front plate **710** gets closer to the downward direction. This is to provide a space in which the first blower fan **F1** may be installed, in an upper portion of the first evaporator **E1** so as to be adjacent to the first evaporator **E1**.

Since the first blower fan **F1** may be disposed at the lower portion of the front plate **710**, the remaining portions except for the lower portion of the front plate **710** may be provided in a flat plate form.

A barrier wall **740** that constitutes the space in which the first evaporator **E1** and the first blower fan **F1** are installed at a lower portion of the rear side of the upper storage compartment **21**, may be disposed at the lower portion of the front plate **710**.

Since the barrier wall **740** constitutes the space in which the first evaporator **E1** and the first blower fan **F1** are installed, the barrier wall **740** may be disposed to be further spaced apart from the inner case **11** than a spaced distance between the first cold air duct **700** and the inner case **11**.

Thus, an upper portion of the barrier wall **740** may be in close contact with the lower portion of the front plate **710** disposed to be bent in the streamline form so that the space between the first cold air duct **700**, the barrier wall **740**, and the inner case **11** and the upper storage compartment **21** may be sealed.

The cold air flow path portion **720** may include a first cold air flow path portion **721** in which a plurality of discharge holes **721a** corresponding to the plurality of first cold air outlets **711** are disposed and which is disposed at the rear side of the front plate **710**, and a second cold air flow path portion **723** that is coupled to a rear side of the first cold air flow path portion **721** and causes the first flow path **725** to be formed between the second cold air flow path portion **723** and the first cold air flow path portion **721**.

The first blower fan mounting portion **730** may be disposed at a lower portion of the cold air flow path portion **720** and may include a housing **731** on which the first blower fan **F1** is rotatably mounted, and a cover member **733** that covers an open front side of the housing **731**.

A drainage portion **750** for draining condensed water generated in the first evaporator **E1** may be disposed at the lower portion of the first evaporator **E1**. The drainage portion **750** may be disposed to have an inclined surface **751** that is inclined in the downward direction as it gets closer to

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a right side of the drainage portion 750 based on a central part of the drainage portion 750, and a drainage hole 753 is formed in a distal end of the inclined surface 751.

A drainage pipe 755 for draining the condensed water toward the outside of the body 10 may be disposed in the drainage hole 753. The drainage pipe 755 may be disposed between the inner case 11 and the outer case 13 of the right surface of the body 10. In an alternative embodiment, the arrangement of the drainage portion 750 may be reversed. For example, the drainage portion 750 may be disposed to have an inclined surface 751 that is inclined in the downward direction as it gets closer to a left side of the drainage portion 750 based on a central part of the drainage portion 750, and a drainage hole 753 may be formed in a distal end of the inclined surface 751, such that the drainage pipe 755 may be disposed between the inner case 11 and the outer case 13 of the left surface of the body 10.

Since the drainage pipe 755 may be disposed between the inner case 11 and the outer case 13 of the side of the body 10 (not between the inner case 11 and the outer case 13 of the rear side of the body 10), when the insulating material 15 is foamed in the space between the inner case 11 and the outer case 13 of the rear side of the body 10, the insulating material 15 may flow smoothly. A configuration in which the insulating material 15 is foamed in the space between the inner case 11 and the outer case 13 of the rear side of the body 10, will be described below.

As illustrated in FIGS. 2 and 43, the machine compartment 28 disposed at the lower side of the rear of the body 10 may be covered by the machine compartment cover 29.

The machine compartment cover 29 may include a machine compartment upper cover 29a that covers the front side and the upper portion of the machine compartment 28 and a machine compartment rear cover 29b that covers the rear side of the machine compartment 28.

In the drawings, an insulating material inlet 29c (see, e.g., FIG. 44) that will be described below is disposed at a position at which the insulating material 15 is foamed in the space between the inner case 11 and the outer case 13 of the body 10. A space in which the insulating material 15 is filled, will be described as the space between the inner case 11 and the outer case 13.

However, the insulating material inlet 29c may be disposed at a position at which the insulating material 15 may be foamed in the door 30.

The insulating material 15 may be foamed and filled in the space between the inner case 11 and the outer case 13 by using a foaming head 810.

The insulating material inlet 29c may be disposed at the machine compartment upper cover 29a of the machine compartment cover 29 that covers the machine compartment 28 so as to foam the insulating material 15 in the space between the inner case 11 and the outer case 13.

The insulating material inlet 29c may be disposed at a position corresponding to a space of the rear side of the body 10 so as to foam the insulating material 15 into the space of the rear side of the body 10 of the space between the inner case 11 and the outer case 13.

The insulating material inlet 29c may be disposed in the middle of the machine compartment cover 29 so that the insulating material 15 foamed through the insulating material inlet 29c may be uniformly filled in the space between the inner case 11 and the outer case 13.

In order to foam the insulating material 15 in the space between the inner case 11 and the outer case 13, the foaming head 810 connected to the insulating material inlet 29c disposed at the machine compartment upper cover 29a and

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a guide member 820 connected to the insulating material inlet 29c in the space between the inner case 11 and the outer case 13 are disposed.

The foaming head 810 foams the insulating material 15 into the insulating material inlet 29c so that the insulating material 15 may be filled in the space between the inner case 11 and the outer case 13.

In the drawings, only one insulating material inlet 29c is disposed, and one foaming head 810 is configured to correspond to the insulating material inlet 29c. However, embodiments of the disclosure are not limited thereto, and a plurality of insulating material inlets may be disposed, and a plurality of foaming heads may be configured to correspond to the plurality of insulating material inlets.

When the foaming head 810 is connected to the insulating material inlet 29c and foams the insulating material 15, the insulating material 15 is foamed into the space between the inner case 11 and the outer case 13 from the insulating material inlet 29c and is filled therein. In a large refrigerator and a refrigerator having a thin insulation thickness wall in which a distance between the inner case 11 and the outer case 13 is narrow, the flow of the insulating material 15 may be disturbed by an obstacle, such as a wire (not shown) in the space between the inner case 11 and the outer case 13 so that a discharge distance of the insulating material 15 is reduced and the entire space between the inner case 11 and the outer case 13 may not be uniformly filled.

Also, in order to uniformly fill the entire space between the inner case 11 and the outer case 13, a quantity of the insulating material 15 foamed in the space between the inner case 11 and the outer case 13 need to be excessively injected compared to the volume of the space between the inner case 11 and the outer case 13.

If the insulating material 15 is excessively injected, a hardening time of the insulating material 15 foamed into the space between the inner case 11 and the outer case 13 may be delayed, and a part of the insulating material 15 is exposed to an outside of the space between the inner case 11 and the outer case 13 so that the exterior and quality of the refrigerator is lowered. Since the insulating material 15 exposed to the outside of the space between the inner case 11 and the outer case 13 need to be removed, this is inconvenient, and a working time when the insulating material 15 is filled in the space between the inner case 11 and the outer case 13 is delayed, and when the foaming head 810 is not properly managed, a void phenomenon that a pore having a crater shape is generated on the surface of the insulating material 15 hardened in the space between the inner case 11 and the outer case 13, may occur.

In order to prevent the above-described problem, the guide member 820 is disposed in such a way that the insulating material 15 foamed by the foaming head 810 may be guided to a portion that extends by a predetermined section into the space between the inner case 11 and the outer case 13 rather than the insulating material inlet 29c without an interference, such as an obstacle.

One end of the guide member 820 may be connected to the insulating material inlet 29c in the space between the inner case 11 and the outer case 13, and the other end of the guide member 820 may extend into the space between the inner case 11 and the outer case 13, and the guide member 820 may guide the insulating material 15 foamed by the foaming head 810.

As illustrated in FIGS. 43 and 44, the guide member 820 may include a connector 821 coupled to the insulating material inlet 29c and a guide pipe 823 connected to the

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connector **821** so as to extend into the space between the inner case **11** and the outer case **13**.

The guide pipe **823** may be formed as a hollow, straight pipe and may guide the insulating material **15** foamed by the foaming head **810** by a length of the guide pipe **823** in the space between the inner case **11** and the outer case **13** without an interference of an obstacle in the space between the inner case **11** and the outer case **13**.

Since an initial discharge position of the insulating material **15** foamed by the foaming head **810** using the guide pipe **823** extends from the insulating material inlet **29c** into the space between the inner case **11** and the outer case **13** by the length of the guide pipe **823** and the initial discharge position of the insulating material **15** extends from a bottom end of the rear side of the body **10** to a central part of the body **10**, disturbance caused by the obstacle in the space between the inner case **11** and the outer case **13** may be minimized. Since a high pressure of the insulating material **15** is maintained while the insulating material **15** passes through an inside of the guide pipe **823**, the entire space between the inner case **11** and the outer case **13** may be uniformly filled with the insulating material **15**, and a quantity of injection of the insulating material **15** may be minimized.

In addition, the void phenomenon that occurs in the surface of the insulating material **15** when the insulating material **15** is foamed and the insulating material **15** is hardened in the space between the inner case **11** and the outer case **13** due to surface friction may be prevented, and the quantity of injection of the insulating material **15** may be minimized so that the insulating material **15** is not exposed to the outside and the working time may also be reduced.

As illustrated in FIG. **45**, a guide member **830** may be provided by forming a connector **831** and a guide pipe **833** as an integral body and may be coupled to the insulating material inlet **29c**.

Except for the feature that the connector **831** and the guide pipe **833** are formed as an integral body, like the guide member **820** illustrated in FIG. **44**, the guide pipe **833** may be formed as a hollow, straight pipe and thus, a description thereof will be omitted.

As illustrated in FIGS. **46** and **47**, a guide pipe **825** may include a first guide pipe **827** that is formed as a hollow, straight pipe and is connected to the connector **821** and a second guide pipe **829** diverged from the first guide pipe **827**.

The second guide pipe **829** causes the insulating material **15** that passes through the first guide pipe **827** to be diverged in two directions and dispersed so that the entire space between the inner case **11** and the outer case **13** may be effectively filled.

The guide pipe **825** including the first guide pipe **827** and the second guide pipe **829** may have an overall hollow, Y shape. However, the disclosure is not limited thereto, and more than two pipes may diverge from the first guide pipe **827**.

As illustrated in FIG. **48**, the guide member **830** may be disposed by forming the connector **831** and a guide pipe **835** as an integral body and may be coupled to the insulating material inlet **29c** and the guide pipe **835** may be disposed to have a hollow, Y shape.

The guide pipe **835** may be formed as a hollow, straight pipe, like the guide pipe **825** illustrated in FIG. **46**. The guide pipe **835** may include a first guide pipe **837** connected to the connector **831** and a second guide pipe **839** diverged from the first guide pipe **837**.

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As described above, when the insulating material **15** is foamed in the space between the inner case **11** and the outer case **13**, the guide members **820** and **830** may be used so that the flow of the insulating material **15** is not disturbed. However, instead of using the guide members **820** and **830**, as illustrated in FIG. **49**, the drainage pipe **755** for draining the condensed water generated in the refrigerant pipe **P** through which the refrigerant flows or in the first evaporator **E1** to the outside of the body **10** may be disposed between the inner case **11** and the outer case **13** of the side of the body **10** so that the flow of the insulating material **15** may not be disturbed when the insulating material **15** is foamed in the space between the inner case **11** and the outer case **13** of the rear side of the body **10**.

As described above, according to the example embodiments of the disclosure, even when a thickness of the insulating material is reduced, rigidity may be maintained using a reinforcement structure so that deformation of a body may be reduced.

In addition, an electric apparatus box may be disposed in a hinge cover so that spatial utility may be improved. A fire that breaks out in the electric apparatus box may be prevented from being spread toward an outside of the electric apparatus box.

Furthermore, a heating pipe may be disposed adjacent to an outer case so that dew condensation that occurs in an outer surface of the outer case may be prevented, and the heating pipe may be easily fixed to the inner case.

Although example embodiments of the disclosure have been shown and described, it would be appreciated by those skilled in the art that changes may be made to these embodiments without departing from the principles and spirit of the disclosure, the scope of which is defined in the claims and their equivalents.

What is claimed is:

1. A refrigerator comprising:

a body comprising an inner case in which a storage compartment is formed, an outer case that is coupled to an outside of the inner case and constitutes an exterior, and an insulating material disposed between the inner case and the outer case; and

a reinforcement member disposed between the inner case and the outer case of both sides of the body to prevent deformation of the body,

wherein

the reinforcement member is disposed at both sides of the body in a widthwise direction, and

a first portion of the reinforcement member is attached to the inner case and is connected to one end of a second portion of the reinforcement member which is bent away from a side surface of the inner case, and a third portion of the reinforcement member is attached to the inner case and is connected to another end of the second portion of the reinforcement member so that a gap including the insulating material is provided between the side surface of the inner case and the second portion of the reinforcement member.

2. The refrigerator of claim 1, wherein the reinforcement member comprises a first reinforcement member disposed at an upper portion of both sides of the body and a second reinforcement member disposed at a lower portion of both sides of the body.

3. The refrigerator of claim 2, wherein the reinforcement member is disposed to have a thickness of about 0.5 mm.

4. The refrigerator of claim 3, wherein the reinforcement member is disposed to have a cross-section having an uneven shape, the cross-section having a larger thickness

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than a thickness of the reinforcement member and a smaller height than a distance between the inner case and the outer case.

5. A refrigerator comprising:

an inner case in which a storage compartment is formed;
an outer case that is coupled to an outside of the inner case and constitutes an exterior;

an insulating material disposed between the inner case and the outer case; and

a reinforcement member disposed between the inner case and the outer case to prevent deformation of the inner case and the outer case that occurs due to a difference in quantities of thermal contraction of the inner case and the outer case when the insulating material is foamed between the inner case and the outer case and then is solidified, the reinforcement member comprising:

a first portion attached to a side surface of one of the inner case and the outer case,

a second portion connected at one end to the first portion and bent away from the side surface of the one of the inner case and the outer case, and

a third portion attached to the one of the inner case and the outer case and connected to another end of the second portion so that a gap including the insulating material is provided between the side surface of the one of the inner case and the outer case and the second portion.

6. The refrigerator of claim 5, wherein the reinforcement member is disposed to correspond to a direction in which the insulating material is foamed between the inner case and the outer case and flows.

7. The refrigerator of claim 6, wherein the reinforcement member is disposed at both sides of the inner case in a widthwise direction and is attached to the inner case.

8. The refrigerator of claim 6, wherein the reinforcement member is disposed at both sides of the outer case in a widthwise direction and is attached to the outer case.

9. The refrigerator of claim 6, wherein the reinforcement member is disposed at both sides of the inner case in a lengthwise direction and is attached to the inner case.

10. The refrigerator of claim 6, wherein the reinforcement member is disposed at both sides of the outer case in a lengthwise direction and is attached to the outer case.

11. A refrigerator comprising:

an inner case in which a storage compartment is formed;
an outer case that is coupled to an outside of the inner case and constitutes an exterior;

an insulating material disposed between the inner case and the outer case; and

a reinforcement member disposed between the inner case and the outer case at both sidewalls of the inner case to prevent deformation that occurs in a lateral direction of the inner case and the outer case due to a difference in quantities of thermal contraction between the inner case and the outer case when the insulating material is foamed and then is solidified, the reinforcement member comprising:

a first portion attached to a side surface of one of the inner case and the outer case,

a second portion connected at one end to the first portion and bent away from the side surface of the one of the inner case and the outer case, and

a third portion attached to the one of the inner case and the outer case and connected to another end of the second

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portion so that a gap including the insulating material is provided between the side surface of the one of the inner case and the outer case and the second portion.

12. The refrigerator of claim 11, wherein the reinforcement member is disposed to correspond to a direction in which the insulating material is foamed between the inner case and the outer case and flows.

13. The refrigerator of claim 12, wherein the reinforcement member is disposed at both sides of the inner case in a widthwise direction and is attached to the one of the inner case and the outer case using an adhesive.

14. The refrigerator of claim 12, wherein the reinforcement member is disposed at both sides of the inner case in a lengthwise direction and is attached to the one of the inner case and the outer case using an adhesive.

15. The refrigerator of claim 11, wherein the reinforcement member is disposed to have a thickness of about 0.5 mm and is formed of steel.

16. The refrigerator of claim 11, wherein the reinforcement member is disposed to have a cross-section having an uneven shape, the cross-section having a larger thickness than a thickness of the reinforcement member and a smaller height than a distance between the inner case and the outer case.

17. The refrigerator of claim 11, further comprising a reinforcement frame disposed at a front side of the refrigerator to supplement rigidity of the body, the reinforcement frame including at least one of an upper reinforcement frame coupled to an upper portion of the front side of the inner case, an intermediate reinforcement frame coupled to a central portion of the front side of the inner case, a lower reinforcement frame coupled to a lower portion of the front side of the inner case, and a side reinforcement frame coupled to a lower side portion of the front side of the inner case.

18. A refrigerator comprising:

an inner case in which a storage compartment is formed;
an outer case that is coupled to an outside of the inner case and constitutes an exterior;

an insulating material disposed between the inner case and the outer case; and

a reinforcement member disposed in the insulating material between the inner case and the outer case at a side of the body, and being attached to one of the inner case and the outer case, the reinforcement member comprising:

a first portion attached to a side surface of one of the inner case and the outer case,

a second portion connected at one end to the first portion and bent away from the side surface of the one of the inner case and the outer case, and

a third portion attached to the one of the inner case and the outer case and connected to another end of the second portion so that a gap including the insulating material is provided between the side surface of the one of the inner case and the outer case and the second portion.

19. The refrigerator of claim 18, further comprising a vacuum insulation panel disposed between the inner case and the outer case together with the insulating material,

wherein the reinforcement member is attached to the side surface of the inner case and the second portion is bent away from the side surface of the inner case toward the vacuum insulation panel.

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